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DOMINIK (T.). **Synopsis of a new classification of the ectotrophic mycorrhizae established on morphological and anatomical characteristics.** *Mycopathologia*, **11**, 4, pp. 359–367, 12 fig., 1959.

This classification, developed at the Forest microbiol. Lab., Forest Res. Inst. Szezecin, Poland [cf. **36**, 50], provides for 12 subtypes (A–L), identifiable by a key. It is considered that such a classification, provisional though it may be, will help individual workers to compare notes.

TATARENKO (E. S.). Паразитизм плесневых грибов. [Parasitism of mould fungi.] —*C.R. Acad. Sci. U.R.S.S.*, **124**, 1, pp. 220–222, 3 fig., 1959.

Of 35 spp. of *Aspergillus* and *Penicillium* studied at the Ukrainian sci. Res. Inst. for the Food Industry, 19 were parasitic on the other spp. Examples of intergeneric, interspecific, and intraspecific parasitism were encountered, as well as parasitism within a single population. One strain may be parasite or host according to the conditions. Where moulds parasitize others, conidiophores and conidia are mainly attacked, more rarely the aerial mycelium. In monospore cultures, after the formation of the conidia, a secondary mycelium is formed, the hyphae of which penetrate adjacent conidiophore vesicles, or through their own, growing down the conidiophores. The parasitic fungi nearly always attacked host fungi which had finished forming conidiophores and conidia. In the formation of anastomoses between the hyphae of a single fungus, the same phenomenon occurs as in parasitism. Parasitism within a single population may be the reason for the especially pronounced variability in *A. niger* and *A. oryzae*.

MIL'KHIKER (M. A.) & DASKAL (M. A.). Грибы в растворах. [Fungi in solutions.] —*Priroda, Moskva*, **48**, 11, p. 117, 1959.

Cephalosporium acremonium appeared in a 0·48 N aqueous solution of Na_2CO_3 (pH 9–10) used for photography, and *Spicaria violacea* and *Cladosporium herbarum* in the chemical reagent 0·1 N aqueous KCNS (alkaline) at the Inst. Microbiol., Ukrainian Acad. Sci. After $1\frac{1}{2}$ months in the dark *C. acremonium* had formed spherical downy colonies (diam. 5–6 mm.) on brown flat 'bases' on the yellowish white sediment in the solution. Brown sporangia (diam. 0·5 mm.) occurred in clusters. The colonies of *S. violacea* and *C. herbarum* were completely immersed.

ROBBINS (W. J.) & HERVEY (ANNETTE). **Wood extract and growth of Morchella.** *Mycologia*, **51**, 3, pp. 356–363, 1 fig., 1 graph, 1959.

In further studies at the N.Y. bot. Garden and Columbia Univ., N.Y. [cf. **38**, 395], growth of *M. esculenta* and *M. crassipes* was greatly increased by the addition of natural preparations to the medium, especially a water extract of dry beech wood.

MACLEOD (D. M.). **Nutritional studies on the genus Hirsutella. II. Nitrogen utilization in a synthetic medium.**—*Canad. J. Bot.*, **37**, 5, pp. 819–834, 1 pl., 3 graphs, 1959. [39 ref.]

In further studies [**39**, 13] the hydrolysate of *H. gigantea* mycelium was found to contain 14 amino acids: the fungus was unable to utilize inorganic N compounds. Max. growth occurred on a dextrose salts medium with L-glutamic acid as N source, and with yeast extract, inoculum filtrate, and liver fraction 'L' as sources of growth factors.

Strobel (J. W.) & Graham (S. O.). **Some physiologic responses of Glomerella cingulata to various media and growth substances.**—Abs. in *Phytopathology*, **50**, 1, p. 86, 1960.

At Washington [agric. Exp. Sta.] a setae-producing isolate of *G. cingulata* failed to form any setae on a synthetic medium augmented by ether-acetone extracts of *Dieffenbachia amoena* leaves, but did so on the medium alone or with water extracts of the leaves. A non-setal isolate from *Philodendron panduraeforme* on the same media formed setae with the water extract only. On 10 organic media 8 lines from 1 ascus formed setae only on LBA and pea extract agar, but did so also on synthetic media+casein hydrolysate. Similar variations are recorded on other media; monoconidial isolates were stable for production of setae, but ascospore lines varied.

Kamoen (O.). **Physiologie der fructificatie. Onderzoekingen met Chaetomium globosum.** [Physiology of fructification. Studies with *C. globosum*.]—*Verh. Rijksst. PlZiekt. Gent* 1, 40 pp., 1 fig., 5 graphs, 1959. [Engl., Fr. summ. 32 ref. Cyclostyled.]

Among the factors studied for their influence on the fructification of *C. globosum*, a pathogen of jute, on a medium consisting for the most part of 1 l. tap water, 20 g. sucrose, 15 g. agar, 0·5 g. each of KNO_3, $(NH_4)_2SO_4$, K_2HPO_4, and 0·2 g. NaCl, were sources of C and N [**27**, 487; **29**, 474, *et passim*], extracts of other fungi, light, and certain salts.

The C sources were: (1) glucose, sucrose, and maltose, which increased mycelial growth markedly with rising conc. (0·3–3%); (2) soluble starch, cellulose, carboxylmethylcellulose, sorbitol, and mannitol, increasing both mycelial and perithecial development with increasing concs., e.g. up to an av. of 340 perithecia/1·3 sq. cm. at 3% carboxylmethylcellulose as against 43 at 0·3%; and (3) a few C sources, including glycerin and lactose, with little or no stimulatory effect.

Cyanamide was the best N source, raising the number of perithecia from 0 in the control (and many other N sources) to 595/1·3 sq. cm. at 2 g./l. Next best were 1 g. KNO_3 (310), 2 g. $(NH_4)NO_3$ (300), and 200 mg. ureum.

In 1 series of experiments where fungal extracts were incorporated into cultures of *C. globosum* the number of perithecia was increased from few to many by *Verticillium alboatrum*, *Paecilomyces variotii*, *Trichoderma viride*, *Aspergillus niger* (heavy growth), *Dicoccum asperum* (most numerous of all in 1 test), *Fusarium solani*, *F. decemcellulare* [*Calonectria rigidiuscula*], and *Cladosporium cladosporioides* (the 2 last-named giving very large increases).

In 1 test of a 2nd series the number of perithecia/1·3 sq. cm. after 6 days was 289 at pH 5·5 and 386 at 7·5. The addition of culture filtrates of *Chaetomium globosum* changed these numbers to 145 and 500, respectively; *F. culmorum* to 125 and 345, *F. bulbigenum* to 132 and 490, *F. avenaceum* to 94 and 410, *F. equiseti* to 128 and 545, *F. moniliforme* [*Gibberella fujikuroi*] to 89 and 590, *F. conglutinans* [*G. f.* var. *subglutinans*] to 132 and 250, *Pestalotia hartigii* to 108 and 127, *Curvularia* sp. to 148 and 258, *Cladosporium macrocarpum* to 168 and 163, *V. alboatrum* to 234 and 655, *Phialophora atra* to 250 and 645, and *Penicillium notatum* to 265 and 386, while only a little mycelium developed in contact with *Cylindrocarpon radicicola*.

In another experiment on the same lines the counts after 8 days were as follows: control 580 and 720, with *F. culmorum* 470 and 260, *T. viride* 540 and 370, *Humicola grisea* 460 and 1,140, and *D. asperum* 505 and 1,270.

A direct effect of UV light on fructification could not be established [cf. **26**, 73]. Under continuous illumination from a T.L. lamp (40 watt) the number of perithecia/1·3 sq. cm. after 8 days was 125, alternating day and night 16, subdued daylight 64, and continuous darkness 193.

Of the salts tested, $Ca(NO_3)_2$ and $Mg(NO_3)_2$ were the most powerful stimulants

to perithecial formation, the former being still active at 24 mg./l. while the opt. for the latter was 12 mg.

Schoch (H.). **Über geschlechtsbedingte Unterschiede in Wachstum und Fumarsäure-Stoffwechsel von Rhizopus-Arten.** [Sexually determined differences in the growth and fumaric acid metabolism of *Rhizopus* spp.]—*Ber. schweiz. bot. Ges.*, **69**, pp. 112–155, 12 graphs, 1959.

At the bot. Inst., Univ. Basel, Switzerland, + and − strs. of *R. microsporus* and *R. circinans* were compared in shake cultures at 10, 20, 30, and 40° C. Growth, in terms of mycelial dry wt., was often greater for − strs., while + strs. tended to produce more fumaric acid. At extremes of temp. the differences between + and − strs. were lost.

Jerebzoff-Quintin [Quintin-Jerebzoff] (Simonne). **Croissance de Rhizopus nigricans Ehr. et de Nectria galligena cultivés avec ou sans auxine et synthèse de quelques acides organiques et amines.** [Growth of *R. stolonifer* and *N. galligena* cultured with or without auxin and synthesis of some organic and amino acids.]—*C.R. Acad. Sci., Paris*, **250**, 7, pp. 1337–1339, 1960.

Unlike *N. galligena*, *R. stolonifer* [**38**, 464] suffered no inhibition of growth or modification in the synthesis of numerous acids under the influence of indole-β acetic acid at concs. of 50–500 mg./l. In addition to the organic acids already known to occur in *R. stolonifer*, glutaric, citramalic, glyceric, and quinic were detected in cultures on Bach's medium without agar.

Jerebzoff (S.). **Activité de différentes radiations lumineuses sur la croissance des conidiophores fertiles et le déclenchement du rhythme interne de zonations chez Monilia fructicola.** [Activity of different light radiations on the growth of fertile conidiophores and the initiation of the internal rhythm of zonations in *Sclerotinia fructicola*.]—*C.R. Acad. Sci., Paris*, **250**, 8, pp. 1549–1551, 1960.

Like white light, radiations of $\geqslant$ 500 mμ expedite the growth of the fertile conidiophores of *S. fructicola* [**38**, 464], initiating the diurnal endogenous rhythm of zonation formation which continues for several days in total darkness. Radiations of $\leqslant$ 500 mμ are without effect on either phenomenon.

Isaac (I.) & Abraham (G. H.). **Saltation and zonation formation in Verticillium lateritium.**—*Canad. J. Bot.*, **37**, 5, pp. 801–814, 2 pl., 1959.

At the Dept Botany, Univ. Coll. Swansea, Wales, non-sporulating hyaline saltants in subcultures of *V. lateritium* [*Nectria inventa*] increased with the age of the parent stock. The factor (or factors) responsible for saltation resided in the hyphae and was water soluble because no saltation occurred after washing the cultures in distilled water. Zoning in culture was induced by (*a*) stimulation of sporulation by light of specific intensity, period, and wave length following a dark period of more than 9 hr; (*b*) reduction of sporulation from poor mycelial development resulting from temp. changes above or below the opt. temp. for growth, and (*c*) physical collapse of some of the conidiophores in a saturated atmosphere due probably to excessive condensation. Variations in humidity brought no changes in sporulation.

Codner (R. C.) & Polatt (B. C.). **Light-induced production of carotenoid pigments by Cephalosporia.**—*Nature, Lond.*, **184**, 4687, pp. 741–742, 1959.

Following a survey at the Antibiotics Res. Sta., Medical Res. Council, Clevedon, Somerset, of 75 *Cephalosporium* spp. the genus was divided into 3 groups, (1) 25 strs. which do not produce orange or pink pigment when grown in light or dark; (2) 48 strs. producing either pigment in the light but not in the dark; (3) 2 strs. producing either pigment in the light or dark, but less in the dark. Similar intensity

of pigmentation was induced in *C. diospyri* from group 2 by continuous artificial and normal daylight: cultures grown in total darkness and having no pigment become fully pigmented when exposed to light. As pigmentation was most intense on media with a high C/N ratio and/or with a high conc. of carbohydrate it is suggested that the pigments are carotenoids.

Orsenigo (M.) & Zangrandi (V.). **Produzione di metaboliti fitotossici in coltura da parte di Fusicladium.** [The production of phytotoxic metabolites in culture by *Fusicladium*.]—*Ann. Fac. Agr.*, Ser. 7, **1** (*Pubbl. Univ. Sacro Cuore*, N.S., **71**), pp. 1–42, 6 fig., 9 graphs, 1959. [Fr., Engl. summ.]

At the Univ. Cattolica del Sacro Cuore, Milan, evidence was obtained that toxic metabolites are produced by 20–30-day cultures of *F. pirinum* [*Venturia pirina*], *F.* [*Spilocaea*] *eriobotryae*, and *F. amelanchieris* in potato dextrose broth. These substances appeared to be non-specific, affecting rootlets of wheat and oat, yeasts and bacteria, and the green organs of higher plants. They caused wilting of tomato shoots, with an inward rolling of the leaves; this effect, however, was reversible, after 24 hr. in water.

Rubin (B. A.). Биохимические основы иммунитета растений. [The biochemical bases of plant immunity.]—*Agrobiology, Moscow, 1959*, 6, pp. 894–907, 3 graphs, 1 fig., 1959.

From the A.N. Bach Inst. for Biochem., U.S.S.R. Acad. Sci., the author reviews biochemical data relating to immunity [cf. **37**, 331] and considers some of the conclusions to be derived from the biochemical approach. Toxins and their enzyme constituents are given particular attention. As regards respiration, Mme E. V. Artsikhovskaya & Mme E. P. Chetverikovaya (A.N. Bach Inst.) have shown that the increased respiration following infection must be attributed to a plant response, the penetration of the parasite causing a reorganization of the enzyme system catalysing respiration.

Flavoprotein oxidases are especially resistant to toxic action and their activity is greatly increased when resistant plants are infected. Oxidases containing Cu are in general less susceptible to toxins than those containing Fe, e.g. Cu polyphenoloxidase is much more resistant than ascorbinase. Cytochromoxidase is less stable and is usually depressed in the early stages of infection. An exception is the activation of cytochromoxidase by an obligate parasite, which exerts a comparatively moderate action on its host.

Mme T. V. Ivanova [**39**, 136] has shown that the cabbage var. Amager, resistant to *Botrytis*, increases in D-amino acid oxidase activity on infection, while a non-resistant var. does not. Large amounts of amino acids are accumulated in infected tissues of the resistant var.

Hypersensitivity was studied by Mme V. A. Aksenovaya on potato infected by *Phytophthora infestans*. When the tissues of the resistant var. Moskovskiĭ were infected, polyphenoloxidase activity rose sharply and dehydrase activity fell. As the result of the depression of dehydrase activity large quantities of the oxidation products of phenols (i.e. quinones) accumulate in the cell, which leads to the speedy destruction of the cell and its penetration by the hypha. The character of the enzyme activity change was reversed on infected susceptible var. Rannyaya Roza.

The reorganization of the respiratory apparatus of the host plant under the influence of micro-organisms is a typical example of adaptive reaction by the living cell. This interpretation is based on the fact that enzyme activity occurs only when the fungus or toxin are acting on living tissue. Negative results were obtained in all experiments in which the effect of the fungus or toxin was tested *in vitro*. The experimental data show the very important role of oxidizing conversions of the polyphenols in the defence reactions of plants. The oxidation products of the

polyphenols in the host tissues cause the destruction of both the cells and of the parasite in them. The lethal action of the quinones may be due to their denaturization of the albumin components of the protoplasm and the blocking of the enzyme system, the activity of which is dependent on sulphhydryl groups.

Nickell (L. G.). **Antimicrobial activity of vascular plants.**—*Econ. Bot.*, **13**, 4, pp. 281–318, 1959. [174 ref.]

This comprehensive survey from the Phytochemistry Lab., Chas. Pfizer & Co., Inc., Groton, Conn., of the available published data, in tabular form, is a useful source of reference. The plants are listed alphabetically by Latin binomial, other columns indicating activity (against bacteria, fungi, viruses, &c.), type of extract, plant part tested, and literature.

Jacobs (S. E.) & Dadd (A. H.). **Antibacterial substances in seed coats and their role in the infection of Sweet Peas by Corynebacterium fascians (Tilford) Dowson.**—*Ann. appl. Biol.*, **47**, 4, pp. 666–672, 1 pl., 1959.

In experiments at Imp. Coll. Sci. Tech., London, to demonstrate the presence of substances inhibiting the growth of *C. fascians* [cf. **31**, 229] in the seeds of various plants and to determine whether such substances could affect the outcome when sweet pea seeds were inoculated with the organism, it was found that chloramine-T removed bacterial contamination from the seeds without being retained by them, as was the case with $HgCl_2$. It was applied as a 1% (w/v) aqueous solution, freshly prepared for each batch of seed, for 15 min., followed by 3 washes each of 2 min. in sterile, distilled water. This procedure resulted in seed lots with not over 5% contamination, usually by bacteria, occasionally by fungi. Germination of contaminant-free seed was never under 80% and usually over 95%.

Testing for antibacterial substances in the seeds was effected by using soil extract-mannitol agar heavily seeded with *C. fascians*. Inoculation of sweet pea seedlings was carried out by dropping 0·1 ml. of a thick suspension of the pathogen, standardized by opacity to about 10^{11} organisms/ml., upon each seed. The seedlings were then grown in 3 × 1 in. glass tubes with a ½ in. layer of acid-washed silver sand saturated with the above medium. From each of 20 spp. 10 seeds were tested against each of 5 strs. of *C. fascians*.

The results showed that antibacterial substances active against the organism were present in seed of a number of spp. and were located in the seed coats of French bean [*Phaseolus vulgaris*], pea, and sweet pea. There were considerable differences in activity between the seeds of various genera and spp. and even between seeds of a single sp. *C. fascians* displayed str. variation in sensitivity to the antibacterial substances of the seeds of any 1 sp. An inverse relationship was established between the sensitivity of a str. to the sweet pea seed substances and its ability to infect sweet pea seedlings under experimental conditions.

Slavėnas (J.). **Fitoncidų ekstrahavimas iš Garstyčių lapų.** [The extraction of phytoncides from the leaves of Mustard.]—*Darb. Liet. TSR moks. Akad., Ser. B., 1959*, 3 (19), pp. 161–164, 1959. [Russ. summ.]

This paper from the Inst. Biol., Lithuanian Acad. Sci., presents the results of the action of phytoncides extracted from green leaves of *Sinapis alba* and *Brassica juncea* on *Aspergillus niger* [**38**, 665]. Various organic solvents were employed as well as aqueous distillates. Ethyl ether was the best solvent for extracting phytoncide substances from mustard leaves and acetone from *B. juncea*.

Krüger (W.). **Antibiotics as seed protectants.**—*S. Afr. J. agric. Sci.*, **2**, 2, pp. 207–213, 1959. [Afrikaans, Fr. summ.]

At the Coll. Agric. and Exp. Sta., Potchefstroom, in 1956–58, 17 antibiotics were

tested as seed protectants against cob and tassel smut (*Sphacelotheca reiliana*) of maize, kernel smut (*S. sorghi*) of kaffir-corn [*Sorghum caffrorum*], and groundnut decay, due to soil- and seed-borne fungi, mainly *Aspergillus niger*. Wet treatment gave better control of the smuts, but was liable to be phytotoxic. Antibiotics proved more effective against *S. reiliana* than *S. sorghi*, actidione and its derivatives being effective on the whole, but somewhat phytoxic even when dry. Filipin increased emergence of groundnut seed, but in both seasons emergence of untreated seed was also good.

Solov'eva (Mme N. K.) & Rudaya (Mme S. M.). Характеристика продуцента нового антифунгального антибиотика альбофунгина. [Characters of the actinomycete producing the new antifungal antibiotic albofungin.]—Антибиотики [*Antibiotiki*], **4**, 6, pp. 5–10, 1959. [Engl. summ.]

At the All-Union sci. res. Inst. for Antibiotics actinomycete 604–36 isolated from Central Asian grey desert soils (serozem) was designated *Actinomyces albus* var. *fungatus* [nom. nud.; *Streptomyces albus*]. By the agar block method the antibiotic was shown to inhibit *Trichoderma*, *Fusarium sporothichiella*, *Botrytis*, *Candida albicans*, and other fungi. [This is followed (pp. 10–12) by a paper by A. S. Khokhlov & G. S. Rozenfel'd on the isolation and chemical purification of albofungin.]

Kuchar (K. W.). **Untersuchungen über bakterielle Hemmwirkungen auf das Wachstum von Fusarium oxysporum f. cubense.** [Examination of inhibitory effect of bacteria on the growth of *F.o.* f. *cubense*.]—*Sydowia*, **13**, 1–6, pp. 167–177, 1 fig., 6 graphs, 1959.

Tests at the Technische Hochschule, Vienna, Austria, with 45 bacterial strs. showed that max. inhibition [cf. **35**, 213] occurred when the fungus was inoculated on 6-day-old cultures, sterile filtrates from 10–12-day-old cultures, or conc. filtrates from 10-day-old cultures+fresh nutrient. Bacteria inoculated on the developing mycelium checked its growth more effectively if their conc. was high or the mycelium young. Both the fungus and the bacteria were grown on processed yeast bouillon at 25° C.

Gilman (J. C.). **A manual of soil fungi.**—xiv+450 pp., 13 pl., 153 fig., London, Constable & Co. Ltd., 1959. 65*s*.

This is an English issue of the 2nd edition of this useful manual [**36**, 423].

Al-Doory (Y.), Tolba (M. K.), & Al-Ani (H.). **On the fungal flora of Iraqi soils. II. Central Iraq.**—*Mycologia*, **51**, 3, pp. 429–439, 4 graphs, 1 map, 1959. [19 ref.]

Fungi belonging to 150 spp. (41 gen.) were isolated from soil samples from 5 provinces of Central Iraq. The genus most commonly found was *Hormodendrum*, followed (in descending order) by *Aspergillus*, *Fusarium*, *Alternaria*, *Penicillium*, *Humicola*, *Mucor*, and *Pythium*.

Gams (W.). **Isolierung von Hyphen aus dem Boden.** [Isolation of hyphae from the soil.]—*Sydowia*, **13**, 1–6, pp. 87–94, 1959. [27 ref. Engl. summ.]

The method used at the Bodenbiologisches Institut der Forstlichen Bundes-Versuchsanstalt, Mariabrunn, Austria, combines the advantages of known techniques, viz. Rossi-Cholodny contact slide [**38**, 576], nylon gauze [loc. cit.], and natural silk [**38**, 731]. Thin sheets of nylon cut into parallel strips about 1 mm. wide, but left connected at the ends to form grids, were mounted on microscope slides, buried in the soil for 1 week, and examined under the microscope for hyphae caught on the strips or, for the preparation of cultures, the slides were rinsed in sterile water, the strips separated with a sterile razor, and placed, exposed side up, on nutrient

agar treated with 3 μg. aureomycin/ml. The use of cellophane instead of nylon for the isolation of cellulolytic fungi is a modification of Tribe's method [**37**, 703].

Tsao (P. H.), Leben (C.), & Keitt (G. W.). **An enrichment method for isolating Actinomycetes that produce diffusible antifungal antibiotics.**—*Phytopathology*, **50**, 1, pp. 88–89, 2 fig., 1960.

At Univ. Wis., Madison, an earlier technique [**33**, 369] was improved by drying the soil to reduce the microbial population and adjusting pH to favour growth of actinomycetes and inhibit or retard most fungi. Soil samples were dried at room temp. for 5–9 days and then stored. Subsequently 1 g. soil was incubated at 26° C. for 7–9 days with 0·1 g. powdered $CaCO_3$ in a Petri dish kept moist with filter paper. Soil suspensions were incorporated in soybean meal glucose agar, generally at a dilution of 1:30,000,000, which usually gave 10–30 actinomycete colonies/plate; bacteria, though present, did not seriously interfere. After 5–6 days, when the colonies had attained macroscopic size, the plates were sprayed with a mixed spore suspension of 5 mutually non-antagonistic fungi (*Alternaria solani*, *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici*, *Glomerella cingulata*, *Helminthosporium victoriae*, and *Verticillium alboatrum*) and after incubation for 3 more days actinomycetes surrounded by clear inhibition zones were isolated.

Williams (L. E.) & Schmitthenner (A. F.). **Effect of growing crops and crop residues on soil fungi and seedling blights.**—*Phytopathology*, **50**, 1, pp. 22–25, 1960.

At Ohio agric. Exp. Sta., Wooster, maize, wheat, oats, soybean, or lucerne were sown in pots of Toledo silty clay, either alone, or together with the residue of a preceding crop (finely chopped, dried, mature leaves and stems, 8 g./9 lb. soil), or the residue alone was added. After 3 months the soil was analysed for fungal content by plating samples [cf. **37**, 147]. *Penicillium purpurogenum* was abundant when growing wheat was present, but infrequent with wheat residue. *Sphaeronema* spp. increased with maize residue, but decreased with growing maize. Some 13 fungi were affected differently by the crop components, the majority, especially *Penicillium* spp., being most abundant with the residue or crop+residue. Different crops, regardless of component, had different effects on 11 other fungus groups, predominantly *Aspergillus* spp. Many other fungi isolated were not significantly affected by any treatment. Seedling blight (mainly due to *Gibberella roseum* f. *cerealis*) in Seneca wheat sown after the various treatments was least following addition of soybean residue and reduced also by oat and wheat residues and by oats+its residue. The effect on lucerne seedling blight (chiefly *Pythium ultimum*) was the same regardless of whether the growing plant or the residue was used, incidence being lowest after soybeans.

Baker (K. F.) & Olsen (C. M.). **Aerated steam for soil treatment.**—Abs. in *Phytopathology*, **50**, 1, p. 82, 1960.

It is recognized that moist heat at 140° F. will kill pathogens. In air:steam mixtures at 1·5:1 by wt. (1:1 by vol.) temp. is reduced to 180° and at 6·5:1 (4·1:1) to 140°. Aeration may be effected by a Venturi steam jet exhauster or a squirrel-cage blower. Low temp. steam costs less to apply, can be used for a proportionately larger area, reduces post-steaming soil toxicity, and leaves some of the non-pathogenic soil microflora to compete with subsequently introduced pathogens.

Soane (B. D.) & Saunder (D. H.). **Nickel and chromium toxicity of serpentine soils in Southern Rhodesia.**—*Soil Sci.*, **88**, 6, pp. 322–330, 6 fig., 1959.

The unusual infertility problems of soils derived from adjoining serpentine rocks in the vicinity of the Great Dyke are described on the basis of field observations and pot experiments and discussed in relation to the very high Ni and Cr contents of

9 sites selected for analysis. Various growth abnormalities occur on crops cultivated on these soils, including stunting, interveinal chlorosis, and necrosis and puckering of the leaf margins in maize; extreme stunting of tobacco, with distortion and swelling of the stems and complete inhibition of flowering; marked stunting, narrowness, and white chlorosis or a bluish-green discoloration of the leaves, followed by necrosis, in oats; and an intense yellow chlorosis with subsequent necrosis in lucerne.

Oats supplied with $CaCO_3$ at levels corresponding to 4,480 lb./acre and upwards developed only slight symptoms of Ni toxicity [cf. **34**, 144], while the growth of lucerne similarly treated appeared to be normal.

It is concluded that Ni toxicity is responsible for the acute infertility of some of the soils. The association of Cr with the condition is less clear, being complicated by a possible interaction between Cr, P, and Ca in the soil-plant system.

Weber (Anna). **Magnesiummangel. II. Forsøg og undersøgelser pafriland og i store urtepotter 1953–57.** [Magnesium deficiency. II. Experiments and investigations in the open and in large clay pots 1953–57.]—*Tidsskr. Planteavl*, **63**, 3, pp. 394–447, 9 fig., 1 graph, 1959. [Engl. summ.]

In further studies at the Danish Plant Path. Exp. Sta., Lyngby, where Mg deficiency is K-induced [**34**, 484], clear-cut symptoms were observed on tomato, potato, celeriac, cucumber, bean [*Phaseolus vulgaris*], mangold, swede, turnip, and yellow mustard. Oats were not affected in the field but reacted severely to absence of Mg in pots of pure sand. Green-leaved vars. of *Tropaeolum majus*, e.g. Golden Gleam, served as an excellent indicator of Mg deficiency.

Outdoor tomatoes developed 7 new yellow leaves in a month. They responded favourably to soil amendments of 500 kg. $MgSO_4$/ha., while even better results were given by 1,000 kg. combined with sprays of 3–5% (usually the latter conc.). Every application of 1,000 kg. $MgSO_4$ raised the Mg content of the soil to nearly 2 mg./100 g. Neither K nor Mg influenced the content of the other in the soil.

In pot tests $MnSO_4$ and K_2SO_4 (200 and 800 kg./ha., respectively) increased Mg deficiency symptoms. Treatments with Mg proved specially effective in combination with S (300 kg./ha. for oats, wheat, barley, and mangold and 600 for rye). $MgSiO_3$, $MgCO_3$, $MgHPO_4$, $Mg(NO_3)_2$, MgO, and $MgCl_2$ were all superior to $MgSO_4$ in pot experiments.

It was frequently noticed that Mg deficiency symptoms are pronounced only during the summer and tend to disappear more or less completely in the autumn.

Molybdenum deficiency in plants.—*Agric. Gaz. N.S.W.*, **70**, 8, pp. 418–423, 7 fig., 1959.

A general note on Mo deficiency and its effect on a number of crops [**34**, 318; **35**, 343; **36**, 576].

Wilson (G. L.) & Notley (L. F.). **Seed soaking as a method of supplying the molybdenum requirements of Lettuce and Tomatoes.**—*Aust. J. agric. Res.*, **10**, 5, pp. 621–627, 1959.

In experiments at Univ. Queensland Grosse Lisse tomato and Imperial 847 lettuce seeds were soaked in solutions of sodium molybdate of various concs. and dry wt. comparisons made between plants from soaked seed grown in Mo-deficient solutions and from untreated seed in complete solution.

The Mo requirements of tomato plants were met by soaking seeds in 5,000 and 50,000 p.p.m. solutions of Mo for 8 hr., but satisfactory results were not obtained with lettuce [cf. **34**, 63, 407]. Attention is drawn to the importance of the ability of soaked seeds to retain Mo against outward diffusion during germination; the implications of the loss of Mo to the soil by washed, soaked seeds are discussed.

Nespiak (A.). **Studia nad udziałem grzybów kapeluszowych w zespołach leśnych na terenie Białowieskiego Parku Narodowego.** [Studies on the part played by higher fungi in forest associations in the National Park of Białowieża.]—*Monogr. Bot.*, **8**, pp. 3–141, 11 graphs, 1 map, 1959. [Engl. summ.2½ pp. 50 ref.]

An account is given of a 2-yr. study (1955–6) of the floristic associations and the associated larger fungi (mostly basidiomycetes, excluding Polyporaceae), the effect of ecological factors on the associations, and the interrelations between fungi and higher plants. Different communities are described separately, the results are tabulated and represented graphically, and the 425 spp. of fungi identified (18 of which are ascomycetes) are listed.

Marmo (J. C.). **Principais eumicetos patogênicos em atagne a plantas cultivadas na região de Piracicaba, estado de S. Paulo.** [Principal pathogenic eumycetes attacking cultivated plants in the region of Piracicaba, State of São Paulo.] —*Rev. Agric., Piracicaba*, **34**, 4, pp. 245–256, 1959.

These descriptions of 33 fungi include *Bremia lactucae* [map 86] on lettuce and *Sclerotinia fructicola* [map 50] on peaches.

Bonnet (J. L.). **Application de la chromatographie sur papier à l'étude de divers champignons (Basidiomycètes—Hyménomycètes).** [The application of paper chromatography to the study of various fungi (basidiomycetes—hymenomycetes).] *Bull. Soc. mycol. Fr.*, **75**, 3, pp. 215–352, 1959. [552 ref.]

In the 1st part (pp. 219–275) the author reviews in detail the present state of knowledge of the chemical constituents of the fungus body of basidiomycetes (especially hymenomycetes). In the 2nd he presents the results of his own studies on 96 spp. (of 23 gen.), mostly from the Paris region. The descending method, using Arches paper No. 302, was preferred. The work done is considered to demonstrate the importance of paper chromatography in the diagnosis of species and the analysis of their constituents. It can also be of use in taxonomy.

Messiaen (C. M.). **La systématique du genre Fusarium selon Snyder et Hansen.** [The systematics of the genus *Fusarium* according to Snyder and Hansen.]—*Rev. Path. vég.*, **38**, 4, pp. 253–266, 2 pl. (14 fig.), 1959. [Engl. summ. 17 ref.]

The author reproduces in condensed form the revision of *Fusarium* suggested by Snyder and Hansen [**25**, 366]. Simplified descriptions of the 9 chief spp. are given and of some 'cultivars', f.spp., and vars. [**36**, 666].

Delespine (Jeanne) & Chadefaud (M.). **L'asque et la phialide des Ascomycètes.** [The ascus and the phialide of ascomycetes.] *C.R. Acad. Sci., Paris*, **250**, 7, pp. 1317–1319, 1 fig., 1960.

A study of *Gibberella pulicaris* from dead stems of nettle [*Urtica dioica*], its conidial state, *Fusarium sambucinum*, from ascospores in culture, and material of *F. solani* from the Muséum d'histoire naturelle, Paris, demonstrated a similarity between the structure of the phialide and the ascus denoting a measure of homology between them, possibly attributable to their common descent from the sporocyst. Both are provided with an apical apparatus, delimiting a subapical locule, and a pore for the exit of the spores, but in the phialide the spores are produced successively at the expense of the content of the subapical locule, whereas in the asci they are formed simultaneously in the general cavity.

Verhoeff (K.). **Pathogeniteitsverschillen tussen een aantal isolaties van Verticillium albo-atrum.** [Differences in pathogenicity between a number of isolates

of *V. alboatrum*.]—*Tijdschr. PlZiekt.*, **65**, 4, pp. 128–137, 1 pl., 1959. [Engl. summ.]

At the Proefstation voor de Groenten-en Fruitteelt onder Glas, Naaldwijk, microsclerotial, dark hyphal, and hyaline type isolates of *V. alboatrum* [**38**, 312] were tested on a number of glasshouse crops by dipping washed roots in spore suspensions from 4–5-week-old cultures. For chrysanthemum rooted cuttings about 8 cm. long were used. Inoculated plants were potted in steam-sterilized soil and placed in a glasshouse.

The results (tabulated) confirmed that there was no marked specialization, but that the isolates were most pathogenic in their host of origin [loc. cit.]. This was particularly true of 4 isolates from tomato; a 5th, which may have been an 'accidental' inhabitant of tomato, was most pathogenic to cucumber and melon and perhaps originated from one of these hosts.

The tests gave consistent results through the year but in autumn and winter the symptoms were more marked and appeared sooner. They were particularly severe on tomatoes growing on poor soil, which in consequence had poor root systems.

KHAN (S. A.). **A new host of Leveillula (Oidiopsis) taurica.**—*Biologia, Lahore*, **5**, 1, p. 45, 1959.

A note from Agric. Res. Sta., Tandojam, Pakistan, on the occurrence of *L. taurica* on *Papaver rhoeas*, *Centaurea moschata*, and *Nicotiana sylvestris*.

CUTTER (V. M.). **Studies on the isolation and growth of plant rusts in host tissue cultures and upon synthetic media. I. Gymnosporangium.**—*Mycologia*, **51**, 2, pp. 248–295, 3 fig., 1 graph, 1959. [46 ref.]

At the Woman's Coll., Univ. N. Carol., Greensboro, systemically infected, dual-membered callus cultures were established from the telial galls of *Gymnosporangium juniperi-virginianae* on *Juniperus* and maintained for several yr. by periodic transfer [cf. **30**, 594]. Seven strs. of the rust were isolated from these tissue cultures and grown in axenic culture in the absence of the host cells. All were able to re-infect their alternate rosaceous hosts in tissue culture and under field conditions, and 4, presumably dikaryotic, were also able to infect *Juniperus*. One str. was atypical in attacking both *Crataegus* and *Pyrus* and in showing the characteristics of *G. globosum* when infecting *Crataegus*.

RAPER (J. R.). **Sexual versatility and evolutionary processes in fungi.**—*Mycologia*, **51**, 2, pp. 107–124, 1959. [108 ref.]

In this presidential address to the mycol. Soc. of America the author discusses the subject with reference to his studies at Harvard Univ., Cambridge, Mass., and to the relevant literature. He considers that sexuality provides a critical key to eventual rationalization of the diversity of fungi.

PERSON (C.). **Gene-for-gene relationships in host : parasite systems.**—*Canad. J. Bot.*, **37**, 5, pp. 1101–1130, 1959.

In considering at the Res. Sta., Res. Branch, Canada Dept Agric., Winnipeg, Man., Flor's postulate of the gene-for-gene relationship [**39**, 275] as applied to the flax: *Melampsora* system [**35**, 526], a theoretical host-parasite system with 5 loci was constructed to illustrate the properties of any such system, and methods used for its analysis. Analysis of this system and that of *Solanum*: *Phytophthora infestans* confirmed Flor's hypothesis. Analysis of Flor's data, however, showed that most of his 'single-gene' differential flax vars. possessed 2 or more genes for resistance which need not fall into allelic or closely linked groups.

Hori (M.) & Yoshida (M.). **On the formation of the oospore of Phytophthora infestans (Mont.) de Bary.**—*Ann. phytopath. Soc. Japan*, **24**, 2, pp. 87–92, 5 fig., 1959. [Jap. Abs. from Engl. summ.]

In culture at the Min. Agric. and Forestry, Tokyo, and the Faculty of Agric., Tôhôku Univ., Sendai, and on potato stems and leaves and tomato fruits *P. infestans* produced 4 types of imperfect 'oospore', A with a thin colourless wall and light yellowish brown protoplasm, and B with a light brown wall and brown contents, neither with oogonia or antheridia; C with a colourless or light brown oogonial wall and light to dark yellowish brown, granular protoplasm, and D with a reddish brown or brown oogonial wall and similar contents, neither with antheridia. Type D oogonia and oospores were produced abundantly after culture on maize extract agar for 20–30 days at 18° C. and transfer to oatmeal agar. In continuous culture on one medium oogonia were not formed. Only some isolates produced oospores. When isolates were paired [**37**, 553] oogonia with amphigynous antheridia were produced. The imperfect 'oospores' germinated by tubes to form sporangia.

Katsura (K.) & Takahi (Y.). [A study on the sexuality of Phytophthora capsici Leonian. (Part 1).] —Abs. in *Ann. phytopath. Soc. Japan*, **24**, 1, p. 26, 1959. [Jap.]

In further work at Saikyō Univ. [cf. **39**, 8; **37**, 453] single zoospore isolates demonstrated that the fungus is clearly homothallic. Monospore isolates from direct germinating sporangia did not differ from single zoospore isolates in culture characters, in pathogenicity to eggplant fruit, in zoosporangial shape, in the frequency of direct or indirect germination, or in the phenomena occurring in 93 paired combinations.

Nelson (R. R.). **The genetics of sexual reproduction in Cochliobolus heterostrophus.** —*Phytopathology*, **49**, 5, p. 319, 1959.

Nelson (R. R.). **Genetics of Cochliobolus heterostrophus. I. Variability in degree of compatibility. II. Genetic factors inhibiting ascospore formation. III. Genetic factors inhibiting ascus formation. IV. A mutant gene that prevents perithecial formation.**—*Mycologia*, **51**, 1, pp. 18–23; 24–29; 2, pp. 132–137, 1959; *Phytopathology*, **49**, 6, pp. 384–386, 1959.

In further studies [**37**, 281] at N. Carol. State Coll., Raleigh, a mutant gene 'i', found only in wild type '*a*' strs. of *C. heterostrophus*, was demonstrated to block the formation of proto-perithecia if compatible isolates both carrying the gene were paired; its inheritance is independent of the compatibility locus. In sterile perithecia, normal in appearance, the ascogenous hyphae fail to develop, indicating inhibition of plasmogamy. The production of sterile asci is controlled by 2 additional factors preventing normal reduction division.

Monoconidial and monoascosporic isolates displayed marked differences in degree of compatibility, the most critical comparison being made by determining the relative frequency with which isolates failed to cross with known compatible isolates. The characters of ascospore progeny from conidial crosses suggested that the differences in degree of compatibility are gene-controlled. Genes controlling intergroup fertility influence the major gene locus for compatibility; results support the view that the sexual mechanism in *C. heterostrophus* is complex.

A selfed monoascosporic isolate (from a cross of 2 heterothallic conidial isolates) which produced perithecia with sterile asci was later found to consist of 2 kinds of homokaryotic hyphae, one functioning as the *A* compatibility group and the other as *a*. Crosses of these always produced the sterile ascus condition, but with heterothallic isolates they produced perithecia containing both sterile and fertile asci.

When ascospores from these crosses were back-mated to both components, sterile perithecia with all asci sterile, and perithecia with sterile and fertile asci in varying ratios were produced. It is concluded that the process inhibiting ascospore formation is controlled by more than a single gene.

An albino str. mated with an 'i' str. produced self-sterile isolates which, however, were compatible with both parental strs. and with all *A* strs., but only with the original *a* parent of the 30 *a* isolates tested. The compatibility locus probably comprises a number of closely linked genes; isolates of the same compatibility group are not genetically similar at all loci involved in the sexual process.

Certain *A* monoascosporic isolates from a cross of 2 wild-type conidial strs. were completely inhibitory both to the compatible *a* parental str. and about half the *a* strs. isolated from nature. Alteration of the medium failed to induce perithecial formation. The widespread occurrence of the mutant gene in wild-type *a* strs. and its absence from the *A* suggests an early origin in the evolution of the sp.

Saaltink (G. J.). **Het uitwendig steriliseren van planten bij fytopathologisch onderzoek.** [External sterilization of plants during plant disease investigations.]—*Tijdschr. PlZiekt.*, **65**, 4, pp. 138–141, 1959. [Engl. summ.]

At the Laboratorium voor Fytopathologie, Wageningen, it was found that surface treatment of lupin plant parts with 0·2% mercuric chloride (alone or with tween 80; 2 min.), 4% sodium hypochlorite (2 min.), or ethyl alcohol (50–96%, 2–10 min.) did not suffice to remove all spores of *Fusarium oxysporum*. The plants were dipped in a spore suspension before sterilization and tissue samples, broken down in a Waring blender, were plated on peptone agar.

Tulecke (W.) & Nickell (L. G.). **Production of large amounts of plant tissue by submerged culture.**—*Science*, **130**, 3379, pp. 863–864, 1 fig., 1 graph, 1959.

By this culturing technique devised at the Chas. Pfizer Phytochemistry Lab., New York, the rate of tissue production is substantially increased by using a 20 l. carboy for the final growth stage, the liquid medium being inoculated from the usual culture flasks. Aeration is considered to be the most important factor involved. Growth values of rose stem tissue (Paul's Scarlet) after 2 weeks were 14·9 in the carboy and 1·9 in shake-flask culture.

Zentmyer (G. A.), Gilpatrick (J. D.), & Thorn (W. A.). **Methods of isolating Phytophthora cinnamomi from soil and from host tissue.**—Abs. in *Phytopathology*, **50**, 1, p. 87, 1960.

When firm fruits of Fuerte avocado pear were half embedded in soil flooded with water in containers *P. cinnamomi* [**39**, 277] produced brown, firm, circular spots at the water line in 3–6 days. Opt. period of leaving the fruit in the mud was 48–96 hr., with some infection in 24 hr. Opt. temp. was 27° C., with light infection at 12° and none above 30°. In similar assays with apples other fungi interfered, but rarely with avocado. Avocado fruits in wire baskets in a soil-water suspension also trapped the fungus. Small seedlings of *Persea indica* [**38**, 22] developed stripe cankers on the stem 2–3 days after planting in infested soil. The fungus is readily isolated from diseased avocado trees by plating on cornmeal agar small, washed, infected roots, dipped in 70% alcohol and blotted dry. At 20–24° it is easily identified in 48 hr., before overgrowth by other spp.

Gerwitz (L. D.), Sudia (T. W.), & Durbin (R. D.). **A controlled-temperature chamber.**—*Phytopathology*, **49**, 12, p. 832, 1 fig., 1959.

This apparatus, described from Inst. Agric., Univ. Minn., St. Paul, is made of $\frac{3}{16}$ in. thick plexiglass sheets, bonded watertight at room temp. with ethylene dichloride

or a commercial plastic solvent. It consists of lidless inner and outer boxes, forming a water jacket between, with a water inlet tube at the bottom and several outlet tubes at the top to avoid pressure buildups. Temp. is regulated by manipulating the ratio of hot to cold water passing through the jacket; a suitable source of illumination can be suspended over the top, with a fan to circulate air between lights and unit.

Kondo (W. T.), Graham (S. O.), & Shaw (C. G.). **Modifications of the cellophane culture technique for photographing and preserving reference colonies of micro-organisms.**—*Mycologia*, **51**, 3, pp. 368–374, 1 fig., 1959.

At Washington State Coll., Pullman, several improvements in this technique [cf. **36**, 46] have been devised. Larger cellophane disks (7 cm.) were used and to avoid wrinkling these were alternated with filter-papers, placed in a deep Petri dish, and autoclaved dry at 15 lb. for 20 min. With materials at the ambient temps., individual disks were dipped in water and then arranged on the surface of suitable 2·5% agar, and incubated for 48 hr., to allow absorption of excess moisture by the medium. Biscuits of inoculum from donor plates were used rather than spore suspensions, which spread.

To preserve colonies without uneven shrinkage during drying of the cellophane carrier this was mounted on small glass plates by a procedure which is described. The most satisfactory mounting medium tested was one containing gelatin 3 g., glycerine 3 ml., and phenol 0·2 g. in 100 ml. water.

Drawert (H.) & Schlafke (Eva). **Vitalfärbungs- und Plasmolysestudien an den Hyphen von Polystictus versicolor L. und einigen anderen Basidiomyceten.** [Studies on vital staining and plasmolysis of hyphae of *P. versicolor* and some other basidiomycetes.]—*Ber. dtsch. bot. Ges.*, **72**, 10, pp. 429–439, 2 fig., 1959.

Tests at the Pflanzenphysiologisches Inst. der Freien Univ., Berlin, showed that Janus green B was well tolerated by the hyphae when introduced to the culture medium. The mycelium continued to grow undisturbed at first, and in the tips of the hyphae rod-like chondriosomes became coloured. The long filamentous 'chondriosomes' in the sub-terminal cells would not take the Janus green B but were fluorochromed with berberine sulphate, acridine orange, and reduced meldola blue. The results indicate the specific nature of the hyphal wall, which appears to be impregnated with lipophilic substances, thus restricting the uptake of some stains to the still-growing hyphal tips [cf. **35**, 408].

Bartels (W.). **Die Anwendung der Cordonniermethode bei der Auswertung von Literatur des Gebietes Pflanzenpathologie und Pflanzenschutz.** [The use of the Cordonnier method in evaluating literature in the fields of plant pathology and plant protection.] –*Z. PflKrankh.*, **66**, 10, pp. 627–636, 2 fig., 1959. [Engl. summ.]

At the Pflanzenschutz wissenschaftliche Abteilung der Farbenfabriken Bayer A.G., Leverkusen, the Cordonnier punch card method (G. Cordonnier *Mensuelle de l'Organization, Comité National de l'Organization française, avril-juillet* 1951: cf. K. E. Rotschuh, *Nachr. Dokumentation* 9, pp. 90–91, 1958), also termed the 'peek-a-boo' system, was adjudged very useful in collating and evaluating information in so broad a field as plant pathology. Publications are filed numerically. A card marked out in squares is assigned to each term (crop, pest, compound, country, &c.), the number of each publication in which it is mentioned being recorded by perforating the appropriate square. Publications containing a combination of terms are found by holding the selected cards together against the light, in order to see perforations that correspond.

Brenner (S.) & Horne (R. W.). **A negative staining method for high resolution electron microscopy of viruses.**—*Biochim. biophys. Acta*, **34**, 1, pp. 103–110, 6 fig., 1959.

From the Cavendish Lab., Cambridge, the authors describe the application of a simple technique for the study of the external form and structure of virus particles to tobacco mosaic and turnip yellow mosaic viruses, as representing rod-shaped and small, spherical particles, respectively. High contrast with good preservation is obtained by mixing virus preparations with 1% phototungstic acid adjusted to pH 7·5 and spraying directly on to electron microscope supporting films made from evaporated C.

Siegel (A.). **On the infectivity dilution curve of plant viruses.**—*Phytopathology*, **50**, 1, pp. 89–90, 1960.

Commenting from Univ. Calif., Los Angeles, on a recent paper by Lindner *et al.* [**38**, 543], the author considers that each countable lesion reduces the potential number of lesions only by the number of cells/lesion that could have been infected at inoculation and not by the mean number of epidermal cells lesion. The expression for Y therefore becomes sf(C–YL) or $\frac{\text{sfC}}{1+\text{sfL}}$. A detailed demonstration of the author's line of thought follows.

Solymosy (F.), Farkas (G. L.), & Kiraly (Z.). **Biochemical mechanism of lesion formation in virus-infected plant tissues.**—*Nature, Lond.*, **184**, 4687, pp. 706–707, 1959.

In further studies at Res. Inst. for Plant Protection, Budapest [cf. **38**, 471], polyphenol oxidase activity was estimated (on the basis of readings during the 1st 10–15 min.) in leaves of tobacco, *Nicotiana glutinosa*, and *Datura stramonium* inoculated mechanically with tobacco mosaic, cucumber mosaic, or tobacco necrosis viruses at the 6–8-leaf stage. Activity increased considerably whenever the host-virus combination resulted in the appearance of lesions, but not with systemic infection except at a very late stage. The fact that infiltration into detached leaves of *N. glutinosa* of adequate conc. (10^{-2} M) of substances able to reduce quinones or inhibit their formation before infection with tobacco mosaic virus resulted after 2 days in marked reduction in the number of lesions (ascorbic acid reducing lesion number to nil) demonstrated that lesion formation was due to an accumulation of polyphenol oxidation products resulting from stimulated *in vivo* activity of phenol oxidizing enzymes [loc. cit.]. Direct measurement (iodometric titration) indicated that the conc. of reducing compounds in the leaves must be raised 7–8 times to inhibit lesion formation; the lesions reappear if the conc. is allowed to drop. Lesion development results probably from an accumulation of quinones due to increased polyphenoloxidase activity and possibly at times to a virus-induced breakdown of reducing systems. Polyphenoloxidase activity in leaves of *N. glutinosa* bearing 'lesions' evoked by needle damage was not comparable 24 hr. after damaging to that in virus infected leaves. As judged from transmission experiments the virus multiplied in treated tissues, but this did not lead to the appearance of lesions in the presence of reducing compounds.

Lindner (R. C.), Kirkpatrick (H. C.), & Weeks (T. E.). **Comparative inhibition of virus multiplication by certain types of chemicals.**—*Phytopathology*, **49**, 12, pp. 802–807, 1 graph, 1959.

At State Coll. Wash., and Tree Fruit Exp. Sta. and U.S. Dept Agric., Wenatchee, 233 chemicals were screened for ability to inhibit the multiplication of tobacco mosaic virus (TMV) in cucumber cotyledons, assayed by local lesion counts, and a lesser number with regard to stone fruit [peach] ring spot virus (RSV), assayed

spectrophotometrically [**34**, 344; Bawden, **34**, 514]. All test solutions were applied 24 hr. after inoculation, for TMV by brushing on and for RSV by vacuum infiltration into the cotyledons. Of the more effective chemicals 27, 17 of which had not previously been reported as active against plant viruses, were tested over a range of concs., in comparison with that giving 50% inhibition of TMV. Effective at 1,000 μM or less were thiouracil and 2,6,8-trichloropurine, 6 dyes, Na selenate, 4 antibiotics, A-methopterin, and A-denopterin. Actidione, the most active chemical tested, gave 50% inhibition of TMV at 2 p.p.m. Surfactants, though of no systemic value, proved good surface inhibitors: zephiran (lauryldimethylbenzylammonium chloride), the most effective, gave 50% TMV inhibition at 40 p.p.m.

Blaszczak (W.), Ross (A. F.), & Larson (R. H.). **The inhibitory activity of plant juices on the infectivity of Potato virus X.**—*Phytopathology*, **49**, 12, pp. 784–791, 4 graphs, 1959. [20 ref.]

At Cornell Univ., Ithaca, N.Y., and Univ. Wis., Madison, *Gomphrena globosa* was used to assay the brown spot str. of potato virus X [**36**, 611] in Turkish tobacco sap diluted with water or with sap of various plants. All 26 spp. or vars. tested were found to be inhibitory [cf. **38**, 400], *Capsicum frutescens*, *Chenopodium album*, *C. amaranticolor*, and pelargonium completely; *Datura metel*, *D. stramonium*, potato, *Solanum integrifolium*, spinach, *Phaseolus vulgaris*, broad bean, and clover caused about 90% inhibition, and *Nicotiana* spp. considerably less. Dilution 1:10 generally removed or lessened inhibitory action, though sap of *Capsicum frutescens* and *Chenopodium amaranticolor* ceased to inhibit only at 1:500 and 1:100, while pelargonium was still active at 1:2,000; sometimes such dilution actually increased virus activity, e.g. tomato 55%, and *G. globosa* 143%, indicating the presence of an augmenter: cucumber and 2 *Nicotiana* spp. gave similar results. Heating for 10 min. at 60° C. was generally less effective than dilution in removing inhibitory activity; pelargonium sap still inhibited after 10 min. at 100°. Dilution of infected sap from *D. metel*, *C. amaranticolor*, and *Capsicum frutescens* increased infectivity, indicating the presence of inhibitors.

The inhibitor in potato and *G. globosa* was more active when obtained from young leaves than from old; activity was negligible in potato stems. Sprayed on the upper surface of *G. globosa* leaves before inoculation, sap of *C. frutescens*, *Chenopodium album*, *P. vulgaris*, and spinach was active for at least 7 days and pelargonium for 20. The inhibitory power of some spp. was fully maintained after storage for several weeks at 4°.

Sap from 7 spp. proved similarly inhibitory to tobacco mosaic virus.

Schmidt (H. H.). **Beiträge zur Kenntnis der Ubertragung pflanzlicher Viren.** [Contributions to the knowledge of the transmission of plant viruses.] *Biol. Zbl.*, **78**, 6, pp. 889–936, 16 fig., 4 diag., 1959. [92 ref.]

This is a comprehensive, fully tabulated report and discussion of experimental studies at the Institut für Phytopathologie, Aschersleben, Germany. Feeding aphids through membranes made it possible to observe their behaviour while sucking in solutions and the development of the salivary sheath, which is formed after fasting periods and does not enclose the tips of the stylets during sucking. Neither the non-persistent beet and cucumber mosaic viruses nor the persistent pea enation and beet yellows were transmissible by feeding the aphid vectors on expressed sap of infected plants. The mechanical transmission of the 2 beet viruses was not prevented by 60 min. exposure of the infected leaves to −12° C. nor that of beet mosaic by treatment with liquid N for the same period.

Beet and cucumber mosaic viruses could not be demonstrated in the vectors after rubbing body extracts of viruliferous individuals on test plants. The infection rate was heavily reduced by the addition of aphid extracts to expressed saps.

Beet yellows virus was not transmissible to *Myzus persicae* by means of the injection technique, but pea enation virus was transmitted a few times by the injection of haemolymph from *Acyrthosiphon pisi* which had fed on diseased broad beans to control aphids of the same sp.

Analysis of ultracentrifuged aphid extracts revealed in *M. persicae* infected by beet yellow net and *A. pisi* by pea enation virus a fraction absent from extracts of the controls.

Histological preparations demonstrated changes in the cell nuclei of the stomach region of *M. persicae* infected by potato leaf roll and pea enation viruses not present in uninfected. Other abnormal structures were detected in the small intestine of *M. persicae* infected by beet yellows and more especially by beet yellow net and potato leaf roll, the last-named also occasionally involving the salivary glands. The nuclei of the fat body cells in the vectors were arranged in stellate formation.

Nagel (A.). **Les virus affectant les plantes et leur sort dans les organismes des Arthropodes vecteurs.** [Viruses affecting plants and their fate in the organisms of the Arthropod vectors.]—*Bull. agric. Congo belge*, **50**, 4, pp. 1126–1127, 1959.

A summary of 13 papers (read at the Journées de Pathologie Comparée, Lyons (Mar.) and Paris (June) 1958) by various authors which were published in *Rev. Path. gen.*, **58** (*1958*), 703, [? 1959]. Papers 1–7 deal with the vectors and the remainder with the relationship of plant viruses to the Arthropod vectors.

Heinze (K.). **Versuche zur Ermittlung der Haltbarkeit des Blattroll-Virus der Kartoffel und des Virus der Vergilbungskrankheit der Rübe im Überträger.** [Experiments on the determination of the persistence of Potato leaf roll virus and of the virus of Beet yellows disease in the vector.]—*Arch. ges. Virusforsch.*, **9**, 3, pp. 396–410, 1959. [Engl. summ.]

At the Institut für Gärtnerische Virusforschung, Berlin-Dahlem, individuals of *Myzodes* [*Myzus*] *persicae* transmitted potato leaf roll virus [**39**, 289] to 11 of 23 plants of *Physalis floridana* and *Datura stramonium* within 13 days after 48 hr. feeding on the source plant. After 8 hr. feeding a single aphid could infect only 7 of 17. In many cases transmission was effected only once during a period of 7–10 days. The persistence of infectivity in the vector depends on the amount of virus imbibed. Multiplication of the virus within the aphid is considered to be improbable.

By keeping the aphids and plants at 23–25° C. it was possible in a few cases to reduce the normal period (50 hr.) of celation, i.e. the time of 1st feeding on an infection source to the moment of infection of the 1st test plant, to 7 or even to 1½ hr. Viruliferous aphids could transmit the virus in 10–15 min.

The virus could be imbibed from potato leaves heated for 1 hr. at 56–58°. The aphids retained full infectivity after 10 min. exposure to 41, 45, or 46°. Longer exposures at 30–32° reduced but did not altogether suppress infectivity. Transference of the aphids to 5, 2, 0, or −6° prolonged the celation period to 5–6, or even up to 7–10 days, but did not inactivate the virus within them.

The aphids were unable to penetrate with their stylets through the tissue of healthy *P. floridana* plants infiltrated with the virus, nor could they take it up from leaves treated in this way.

In comparable tests with beet yellows virus infectivity was lost by the aphids within a max. of 5 days. Virus was transmitted to 3 *P. floridana* plants by each of 9 aphids, to 2 by 11, and to 1 by 23. The min. celation period was 1½ hr. Again, multiplication of the virus in the vector seems highly improbable.

Follmann (G.) & Bercks (R.). **Verwandtschaftsbeziehungen zwischen Ringfleckenviren von Kulturkirschen und krautigen Pflanzen.** [Relationship

connexions between ring spot viruses of cultivated Cherries and herbaceous plants.]—*Naturwissenschaften*, **46**, 12, p. 403, 1959.

The results of studies at the Institut für Virusserologie, Brunswick, Germany, revealed common immunological properties in 2 virus isolates from Pfeffinger cherry disease [**39**, 261, 332] on the one hand and European strs. of bean [*Phaseolus vulgaris*] ring spot, potato bouquet, potato pseudo-aucuba, cherry Stecklenberg disease, [pear] stony pit-ring spot [**35**, 372–375 *et passim*], and tomato black ring [**39**, 261] viruses on the other, but no affinity with the N. American tobacco ring spot virus could be demonstrated.

Seventh Inter-American Cacao Conference, 1958.—*Cacao* (*Int. Amer. Cacao Cent.*), **3**, 16, 44 pp., 1958. [Received Feb. 1960.]

Recommendations presented at this conference [cf. **36**, 232] held at Palmira, Valle, Colombia, 13–19 July 1958, included proposals of the sub-committee on pest and disease control (pp. 11–14) for the collection of data on fungicidal application, the development of standard survey procedures for *Phytophthora palmivora* and *Monilia roreri* and the establishment of a centre for the study of *P. palmivora*, investigation of shorter spraying intervals at some stages of infection as a means of improving disease control, increased attention to *Ceratostomella* [*Ceratocystis fimbriata*], and the formation of a world organization to study cacao problems. Recommendations were also made (pp. 14–16) concerning plant introduction and quarantine measures.

The papers presented are summarized [in English, many of the originals were in Spanish or Portuguese] pp. 21–41. In the symposium on the *Xyleborus-Ceratostomella* complex [**37**, 222], chaired by J. A. McLaughlin, R. Desrosiers described 'The *Ceratostomella* problem in Ecuador', where *Ceratocystis fimbriata* was observed as a wound parasite before 1918, but has been of economic importance only since 1951. M. Idrobo described the complex in Colombia [loc. cit.], where *C. fimbriata* [**39**, 15] also attacks *Crotalaria*. G. Malaguti described the disease in Venezuela [**37**, 271], L. Siller in Central America, and C. May drew comparisons with the attack of *Ceratocystis ulmi* on elm [**38**, 229] and *C.f.* var. *platani* on London plane [*Platanus acerifolia*: **38**, 631].

In the section on Entomology and Pathology, chaired by P. Silva, R. Desrosiers spoke on recent advances in the field control of cacao diseases, noting that in Brazil low vol. Cu Sandoz gave outstanding control of *Phytophthora palmivora* [**37**, 465], while in the Philippines combination sprays of dithane Z-78 with an insecticide were promising. Low vol. spraying equipment has improved; spraying trees on both sides with knapsack mistblowers gave good protection against *M. roreri* and 1 man covered up to 5 ha. daily under favourable conditions. B. G. D. Bartley described the reactions of young cacao seedlings to inoculation with *Marasmius perniciosus* [**35**, 427]. In segregating populations, where gradation of symptoms and segregation for plant vigour are simultaneous, the test does not distinguish grades of symptoms as effectively as natural infection. Inconsistency of results has been due to insufficient infection and changes in environmental conditions, which should be maintained at a standard opt. If environment cannot be controlled, a score of the degree of hypertrophy developed may be combined with records of plant growth; despite the difficulties this test is the most useful for large numbers of plants.

P. Befeler outlined field and lab. experiments with 13 stickers and 13 fungicides against *P. palmivora* on cacao seedlings. Spectrographic analysis was made of the amount of fungicide remaining on the leaves after 5 weeks. PEPS (polyethylene-polysulphide) and vancide with perenox, oleocuivre, and orthocide-50 were the best mixtures and were equivalent to the 4–4–50 Bordeaux control. T. de Franco showed that infection by *Monilia roreri* is doubled (75·75% : 35·5%) by the

presence of *Mecistorhinus tripterus* [**37**, 221]. L. M. Hutchins' current surveys for cushion gall have been noticed [**39**, 222].

M. Idrobo described a quick test for the resistance of cacao seedlings to the toxins produced by *C. fimbriata* [**37**, 222]. W. T. Lellis & O. F. Piexoto discussed spraying as opposed to dusting against *P. palmivora* in Bahia, Brazil, using Cu Sandoz with a motorized (Solo) and manual (Pomonax) sprayers and a manual (Roto-farmer) duster. The last-named covered a larger area at smaller cost. G. Malaguti & C. Diaz reported observations on diseases of cacao in Venezuela [**39**, 96] and H. Marques da Cruz outlined results of 3 yr. experiments against *P. palmivora* and pests of cacao in Bahia which indicated that 4 applications of Cu spray/yr. gave economic control of *P.* pod rot and increased yields [cf. **38**, 735]. E. V. Miller & S. I. Cohen spoke on the development of cacao fungicides by the Olin Mathieson Chemical Co. A. Muntzing's field trials in Ecuador have been noticed [**38**, 681]. Comparison by L. R. Siller in Costa Rica of foliar sprays of Bordeaux, alone and containing urea or Zn, showed a small but consistent increase in yield from Zn. In other trials he found Bordeaux was better than perenox, phygon XL (phytotoxic), or crag-531 against *P. palmivora*; it should be applied (high vol.) monthly, rather than only at major flushing periods. Applications to the whole tree or the trunk or foliage alone showed no significant differences. J. M. Thresh & T. W. Tinsley presented a world review of virus diseases of cacao [**39**, 96], including reports of such diseases from Java [*in lit.*] and Colombia [**28**, 8].

Harwood (L. W.). **Diseases of Cocoa.**—*Agric. J. Fiji*, **29**, 2 & 3, pp. 96–98, 1959.

In addition to the following, previously recorded [cf. **36**, 90], viz. pod rot (*Botryodiplodia theobromae*), pink disease (*Corticium salmonicolor*), thread blight (*Marasmius scandens*), black pod (*Phytophthora palmivora*), and a root disease (*Fomes noxius*), a further root disease caused by *Ustulina deusta* [*U. vulgaris*] is noted but is not serious.

Thorold (C. A.). **Methods of controlling black-pod disease (caused by Phytophthora palmivora) of Theobroma cacao in Nigeria.**—*Ann. appl. Biol.*, **47**, 4, pp. 708–715, 1959.

In further studies at Dept agric. Res., Nigeria, no evidence was obtained that resistance to *P. palmivora* [cf. **35**, 753; **36**, 683 *et passim*] occurs within the local population of Amelonado-type trees. Although the proportion of diseased pods was greater on trees spaced 5×5–8×8 ft. than on those 10×10–15×15 ft. the closer spacings often gave more healthy pods/acre. Loss of pods was reduced when the trees were inspected more frequently (on alternate days) and pods displaying the earliest symptoms removed, though this procedure may not be economic unless potential yields are < 12 pods/tree.

Satisfactory control resulted from Cu fungicides applied with a hand-sprayer or a power-sprayer. The monetary return was found to depend on yield rather than disease incidence or spraying costs. Spraying is recommended if the potential yield is 12 or more pods/tree.

Kalashnikov (K. Y.). Скрытые потери урожая зерна от головни. [Concealed losses of grain yield due to smut.]—*J. agric. Sci., Moscow*, **4**, 12, pp. 109–112, 1959. [Engl., Germ., Fr. summ. 13 ref.]

'Concealed loss' is defined in this paper from the All-Union sci. Res. Inst. for Plant Protection as the reduction in yield due to smut where there are no external symptoms. Experiments in 1951–53 showed that the concealed loss from stem smut of rye [*Urocystis occulta*: **34**, 145] was considerable. When seed of the var. Izumrudnaya was 0·51% infected yield was reduced by 18%, and with 0·04% infection on RDS seed loss was 3·6%. On the basis of the literature cited it is concluded that the concealed loss in grain crops is almost equal for the different smuts, so that

conclusions can be based on the results obtained with *Tilletia tritici* [*T. caries*: cf. **38**, 738]. In tests with *T. caries* in 1931–54 on different wheat vars. in different regions of the U.S.S.R. concealed exceeded visible loss in spring wheat with an av. 0·23% infection by an av. 12·2-fold, and by 22·4-fold in winter wheat 0·17% infected.

Yakubtsiner (M. M.). Новые виды Пшеницы. [New species of Wheat.]—*J. agric. Sci., Moscow*, **4**, 12, pp. 29–41, 1959. [Engl., Germ., Fr. summ. 30 ref.]

Among the species used for breeding at the All-Union Inst. for Plant Growing is *Triticum carthlicum* (28 chromosomes), a high alpine sp. from Transcaucasia resistant to powdery mildew [*Erysiphe graminis*] and loose smut [*Ustilago nuda*], and less susceptible to brown rust [*Puccinia recondita*] than hard wheat. Among new synthetic spp. is the amphidiploid *T. fungicidum* (56), a hybrid from *T. timopheevii* × *T. carthlicum* var. *fuliginosum*, highly resistant to fungus diseases. The new winter wheat-rye hybrid *T. lyssaki* is also highly resistant to brown rust and powdery mildew. The progeny of *T. dicoccum farrum* × *Haynaldia villosa* have resistance to powdery mildew and comparatively low susceptibility to brown rust.

Proceedings of the First International Wheat Genetics Symposium, held at the University of Manitoba, Winnipeg, Manitoba, Canada, August 11–15, 1958.—xii+268 pp., 7 fig., 9 diag., 27 graphs, 1959. $5.

Papers of interest to plant pathologists include an account (pp. 12–27) by N. E. Borlaug (Mexico) of the use of multilineal or composite vars. to control airborne epidemic diseases of self-pollinated crop plants. In Mexico the national av. wheat yield increased from 11·2 bush. acre (750 kg. ha.) in 1950 to 24 bush./acre (1,600 kg. ha.) in 1958. The speaker enlarged on the methods employed and their possible effects on cereal rusts. D. R. Knott (Canada) described (pp. 32–38) investigations at Univ. Sask. into the inheritance of stem rust [*Puccinia graminis*] resistance in wheat [cf. **39**, 97 *et passim*]. A. R. da Silva (Brazil) discussed (pp. 39–48) the integration of wheat breeding and rust identification [cf. **35**, 6; **38**, 685] from the point of view of the relationship between the study of physiologic specialization and its application in breeding work. H. C. Thorpe (Kenya) described (pp. 55–66) wheat breeding problems and methods in Kenya [cf. **36**, 686; **37**, 136 *et passim*].

Hacker (R. G.). **Control of black stem rust of Wheat with derivatives of acti-dione.**—Abs. in *Publ. Univ. Wyoming*, **23**, 5, pp. 77–78, 1959.

Applied in large dosages before infection by stem rust [*Puccinia graminis*], actidione S [cf. **37**, 30, 654] gave almost complete control, but only slight control after infection was well established. New growth was as resistant as treated surfaces. Lower stems and leaves unwetted by the application remained as free from rust as did upper parts which received the full effect of the spray. Heads and upper stems produced later on plants treated at the boot stage remained immune.

Histological studies indicated that the uredospores of *P. graminis* failed to germinate on treated leaves and stems, probably because of an inhibitor released from within the plant. It is further postulated that this inhibitor may arise from basic metabolic changes induced by the antibiotic or from the dissociation of the actidione-S molecule to form free cycloheximide, and it may become concentrated in natural secretions on the leaf and stem surfaces.

Silverman (W.). **A study of the necrosis sometimes associated with infection of cereal plants by Puccinia graminis Pers.**—*Diss. Abstr.*, **20**, 1, p. 22, 1959.

At Univ. Minn. Marquis wheat was resistant at 65–75° F. to race 38 of *P. g. tritici* [cf. **38**, 317], forming uredia of infection type 2 [**39**, 163], but was susceptible at 85–95° (type 3). At high temp. the plants produced a water-soluble, heat-stable

toxin which, when infiltrated under partial vacuum into Marquis seedlings grown at low temp., induced chlorotic areas, but it did not do so in those raised at high temp. In Little Club wheat, susceptible to race 38 at all temp., the toxin did not produce chlorosis at any temp. tested. The cells of chlorotic areas had the aberrant chloroplasts characteristic of infection type 2. Swollen, abnormally-staining cell walls develop when Marquis leaves are infiltrated with a pectinase solution. It is suggested that the toxin isolated from infected Marquis wheat, together with pectinase, is responsible for the necrotic ring symptom in infection type 2.

Silverman (W.). **The effect of variations in temperature on the necrosis associated with infection type 2 uredia of the Wheat stem rust fungus.**—*Phytopathology*, **49**, 12, pp. 827–830, 1 fig., 2 diag., 1959.

Marquis seedlings [see above] were placed 24 hr. after inoculation with *Puccinia graminis* at low temp. (day 75°, night 65° F.) or at high (95°, 85°), 3 of each group being reciprocally exchanged each day. Under continuous high temp. early flecks developed 4 days after inoculation; uredia were erumpent on the 7th day, with primary sporulation on the 8th, and secondary on the 9th; there was no necrotic ring. At continuous low temp. early flecks appeared in 5 days and uredia erupted in 8–9, with primary but no secondary sporulation; a peripheral ring appeared on the 7th day and was considered necrotic by the 11th.

With transference from high to low temp. before external symptoms appeared, rust development was as at continuous low temp.; delay of transfer till after sporulation began sometimes induced secondary sporulation, and formation of the ring was accelerated so that it appeared 3 days after transfer. With early transfer from low to high temp., however, both early and mid-fleck stages appeared 5 days after inoculation; this did not occur on plants moved on the 5th or 6th day, nor were eruption or primary sporulation accelerated; secondary sporulation was sometimes delayed for 7 days after transfer. The ring never developed on plants moved from low to high temp. in the 1st 5 days, but on those moved on the 6th day a pale ring appeared 3 days later and persisted for only 2 days (or 4 if formed before transfer on the 7th day) or 6 days with transfer on the 10th day. By the 11th day the processes involved were irreversible and the ring persisted, surrounded by a dark green band, where sporulation occurred 8 days after transfer.

The necrosis aspect of the whole syndrome is seen to be especially sensitive to temp. during lesion development, and whereas at early stages temp. may only have quantitative effects on vegetative growth of the fungus, subsequently qualitative differences appear. Higher temps. favour mycelial extension and sporulation, without chlorosis or necrosis, which are induced by lower temps.

Roane (C. W.), Stakman (E. C.), Loegering (W. Q.), Stewart (D. M.), & Watson (W. M.). **Survival of physiologic races of Puccinia graminis var. tritici on Wheat near Barberry bushes.** *Phytopathology*, **50**, 1, pp. 40–44, 1 diag., 1960.

In joint studies by Va agric. Exp. Sta., Univ. Min., and U.S. Dept Agric. in Wythe County, Va, a different field with an adjacent infected clump of barberry was sown annually from 1950 to 1953 with Fulcaster, Thorne, or Vahart wheat and the races of *P. graminis* found therein determined. Of the 42 races and subraces identified, race 56 occurred each yr., 8 others in 3 of the yr., 8 in 2 yr., and 25 in 1 yr. only. Differences in survival ability of the races were evident, and the different vars. of wheat used had a screening effect. Races 38 and 56 had notably good survival ability; 14, 15B (prevalent elsewhere because of its ability to attack most of the commercial wheats), and 23 were intermediate; 23A, 48, 69, and 186A were poor.

Lučić (S.). **Fiziološke rase Puccinia graminis tritici Erikss. et Henn. u Srbiji u 1954 i 1955 godini.** [Physiologic races of *P. graminis tritici* Erikss. & Henn. in

Serbia in 1954–5.]—*Arh. poljopr. Nauk.*, **12**, 38, pp. 68–81, 2 fig., 1959. [Engl. summ.]

This survey by Inst. for Plant Protection, Belgrade [cf. **36**, 391], notes the isolation of physiologic races 14, 17, 19, 21, and 24, of which 21 was the most pathogenic and widespread, and a new race or biotype which is to be described elsewhere. Morphologic variations were observed between the uredospores of different races, the range of size in Yugoslavia being 24·5–40·3 × 13·1–25·73 μ.

Rodigin (M. N.) & Krasnova (Mme T. M.). Обработка семян микроэлементами против бурой ржавчины Пшеницы. [Seed treatment with micro-elements against brown rust of Wheat.]—*Сел. Хоз. Поволжья* [*Sel. Khoz. Povolzh'ya*], *1959*, 2, pp. 50–52, 1959. [Abs. in *Referat. Zh. Biol.*, *1959*, 21, p. 195, 1959.]

In field experiments in 1956–58 at the training farm of the Saratov agric. Inst. and the Valuĭskaya exp. Sta. seed of the spring wheat vars. Lutescens 758 and Melianopus 1932 was steeped (30 l. centner) in 0·03% H_3BO_3, 0·04% $ZnSO_4$, 0·05% $MnSO_4$, 0·05% Na_2CO_3, and 0·01% $CuSO_4$. All treatments improved growth of the green parts of the plants and increased yield; susceptibility to brown leaf rust [*Puccinia recondita*: **39**, 16] was reduced, particularly by $CuSO_4$, $ZnSO_4$, and H_3BO_3.

Kendrick (E. L.) & Holton (C. S.). **Differential longevity of teliospores of pathogenic races of Tilletia caries and of T. foetida.**—*Phytopathology*, **50**, 1, pp. 51–54, 1960.

At the agric. Exp. Sta., Pullman, Wash., germination tests on 3% water agar were made with powdered spore material and bunt balls of 11 races of *T. caries* and 7 of *T. foetida* which had been stored at room temp. for 18 and 22 yr. [cf. **30**, 29] and compared with similar 1–3-yr. old material. The rate of germination of the old spores was less, though higher in some races than in others. Some spores of all races were viable up to 18 yr., though there were differences in longevity between races. Storage in ball or powdered form usually made little difference. Some races had lost viability at 22 yr.; viable spores of this age germinated so slowly that infection was obtained only by germinating them before seed inoculation.

Newburgh (R. W.) & Cheldelin (V. H.). **Glucose oxidation in mycelia and spores of the Wheat smut fungus Tilletia caries.**—*J. Bact.*, **76**, 3, pp. 308–311, 2 fig., 1959.

From studies at Oregon State Coll. [**34**, 636] it was concluded that the patterns of glucose metabolism in the spores and mycelia differ, particularly in the behaviour of glucose–1–C^{14} and glucose–3,4–C^{14}.

Szczypiński (W.) & Kownacki (M.). **Wstępne badanie niektórych zapraw przeciwko śnieci cuchnącej Pszenicy.** [Preliminary investigation on some seed dressings against the stinking smut of Wheat.]—*Roczn. Nauk rol.*, **78**, Ser. A., 2, pp. 343–346, 1958.

At Puławy na Kępie, Poland, during 4 growing periods (1949–52), aagrano, agronal, agrosan, germisan, panogen, semenon, sanigran, tillex, an inorganic Hg salt, an experimental product AB (a basic Cu carbonate), and prosat neu were compared with agronal [against *Tilletia* spp: **38**, 590]. In the 1st trial, only AB was unsatisfactory; in the 2nd, when incidence was low, all the treatments were successful; in 1951 again there were no significant differences between treatments, though the highest incidence occurred with the inorganic Hg salt. The results in 1952 were very varied, probably owing to unusual weather conditions.

Tyulina (Mme L. R.). Устойчивость сортов озимой Пшеницы против мучнистой росы. [Resistance of winter Wheat vars. to powdery mildew.]—*Sel. Seed-Gr., Moscow*, **24**, 6, pp. 52–53, 1959.

Local and extra-regional wheat varietal resistance to powdery mildew [*Erysiphe graminis*: cf. **37**, 765], particularly the role of the parent plant, was studied at the Inst. for Agric. of the central regions of the non-chernozem zone. Of 14 wheat-grass hybrids tested over 3 yr. the most resistant were 599, 593, 587, 690, infection being 15–31·8%. These are to be used for further breeding. The largest number of comparatively resistant hybrids occurred when hybrid 599 served as the mother plant. In progeny of (186 × 599) × 599 and (599 × 186) × 599 resistance was especially increased where the saturated var. was the ovule parent. Infection was never more than 35% and all were more highly resistant than hybrid 186.

Bockmann (H.). **Über die Infektionswirkung von Ophiobolus graminis Sacc. an Weizen bei partieller Bodensterilisation und organischer Düngung.** [On the effect of *O. graminis* infection on Wheat with partial soil sterilization and organic manuring.]—*Z. PflKrankh.*, **66**, 9, pp. 582–588, 1959. [Engl. summ.]

In inoculation experiments at the Institut für Getreide, Ölfrucht- und Futterpflanzenkrankheiten, Kiel-Kitzeberg, Germany, take-all damage in wheat increased when the soil was steamed for 1½–2 hr., but decreased when stable manure or green manure was present [cf. **37**, 347]. It is concluded that the level of take-all is increased by factors prejudicing the productiveness of the crop.

Michalski (A.) & Gorska-Poczopko (Jadwiga). **Występowanie podsuszki (Ophiobolus sp.) na Pszenicy w północnych rejonach Polski oraz doświadczenia nad odpornością Pszenic na tę chorobę.** [The occurrence of take-all (*O.* sp.) on Wheat in the northern regions of Poland and experiments on the resistance of Wheat to this disease.]—*Roczn. Nauk rol.*, **78**, Ser. A., 2, pp. 185–198, 3 fig., 2 maps, 1958. [Russ., Engl. summ.]

Take-all was observed throughout the wheat growing areas of Pomorze, *O. graminis* being the main pathogen [map 334]. In Lędziechowo and Lubogoszcz, 2 severely affected fields were divided into blocks and sown with different spring wheat vars. Infection was assessed during 1953–4 and 1954–5. Of the 19 vars. tested only Biała Kleszczewska was resistant [cf. **38**, 292] and the high susceptibility of Biała Koszycka and Dańkowska Graniatka Zachodnia was confirmed.

Nisikado (Y.). **Studies on the Wheat scab, caused by Gibberella zeae (Schw.) Petch, and its control.**—*Ber. Ōhara Inst.*, **11**, 2, pp. 141–153, 12 pl. (53 fig.), 1959.

This paper [cf. **38**, 509] summarizes an original detailed account of the disease in Japanese based on studies by the writer since 1913 [**35**, 174].

Some diseases of Wheat.—*Agric. Gaz. N.S.W.*, **70**, 10, pp. 532–536, 8 fig., 1959.

The following minor diseases are described: leaf spot (*Septoria tritici*) [**20**, 354], glume blotch (*S. nodorum*) [**35**, 351: **37**, 133], sometimes confused with a non-parasitic false black-chaff or melanism which is caused on some wheats by high temp. and humidity, bacterial black chaff [*Xanthomonas translucens* var. *undulosa*: **14**, 571], basal glume rot [*Pseudomonas atrofaciens*: **12**, 430], downy mildew (*Sclerospora macrospora*) [**5**, 481], and powdery mildew (*Erysiphe graminis*) [**34**, 706].

Katsura (K.). [A study on the phenomenon of yellows in Barley. Preliminary communication.]—Abs. in *Ann. phytopath. Soc. Japan*, **24**, 1, p. 10, 1959. [Jap.]

Barley yellows [barley yellow mosaic virus: **38**, 501] was shown at Dept Agric., Saikyō Univ., to display various symptoms; X bodies were seen in some cells but

not in others. After autumn sowing necroses and swellings developed on the roots and nematodes, *Pratylenchus* sp. and *Meloidogyne* sp., were seen, the former being particularly numerous. Yellows may develop as early as late autumn. *Pythium* also occurs in affected plants [cf. **35**, 278]. By inoculation with *Pratylenchus* severe yellows was produced. After control with nematocides, yellows and root symptoms disappeared, height and tillering increased, and the yield was some 3 times that of the untreated plants. Yellows symptoms would seem, therefore, to be caused in part by nematodes alone, the yellowing resulting either from their attack or from micro-element deficiency; *Pythium* root rot also has a partial influence, but the presence of X bodies in the cells suggests that a virus disease may also be involved and this is now being investigated.

Hiura (U.) & Tomoda (H.). [On the transmission of pathogenicity by *Erysiphe graminis*.] Abs. in *Ann. phytopath. Soc. Japan*, **24**, 1, pp. 10-11, 1959. [Jap.]

Monospore cultures of *E. graminis* inoculated onto barley at the Fac. Agric., Okayama Univ., did not produce perithecia. When inoculated in pairs, perithecia were formed on about half the total combinations. *E. graminis* from barley is, therefore, heterothallic, cultures forming 2 compatibility groups. Crossing races VI C (attacking Heil's Hanna and Roshia no. 74) and VI A (attacking improved naked barley) and inoculating to the parent hosts demonstrated that pathogenicity to the 3 vars. as well as compatibility were transmitted independently.

Chang (T.-T.). **Analysis of genes conditioning resistance of Oat varieties to races of Puccinia coronata Cda var. avenae F. and L.**—*Diss. Abstr.*, **20**, 4, pp. 1133–1134, 1959.

Recent revision of the system of identifying and numbering physiologic races of *P. coronata* on oats [**39**, 102] has affected the applicability of previous information on inheritance of resistance [**37**, 688], based on tests with races identified in the old series.

At Univ. Minn. 78 crosses among 9 resistant and 5 susceptible oat vars. were tested against races 203, 216, 258, and 276 (new series). The F_2 of certain crosses were inoculated in succession with 2 races to determine the relationship of genes conditioning resistance to different races. Resistance can be explained in terms of 9 genes: V (dominant) conditions moderate resistance to race 276 in Ascencao, and to races 203, 258, and 276 in Moravia, 64 Q, and Victoria; E, independent of V, conditions resistance to race 216 in Ascencao, being hypostatic to a dominant inhibitor gene I_E, present in Criolla Saltena, Gopher, and others susceptible to race 216, viz. Ascencao, Moravia, 64 Q, and Victoria; b^R conditions resistance in Bond to race 258, rating between B (susceptible) and b in dominance, and being hypostatic to the dominant inhibitor I_b in Criolla Saltena, Gopher, and vars. susceptible to race 258; L, partially dominant, governing resistance to races 203, 216, and 258 in Landhafer; S, conferring a higher level of resistance than M and U (all of which were linked) to races 203, 216, and 258 in Santa Fe [cf. **37**, 406]; M confers moderate resistance to race 216 in Bage and [unspecified] resistance to race 216 in Trispernia; U confers moderate resistance to races 203 and 258 in Bage and [unspecified] resistance to race 258 in Trispernia; and R and T, which independently control moderate resistance to race 203 in Trispernia. Argelia and Dom Pedrito have both I_E and I_b and the b allele, and La Prevision I_b only.

Transgressive segregation for higher levels of resistance occurred among progenies of resistant × resistant crosses in reaction to 203 and 258.

Ascencao, Moravia, 64Q, and Victoria were susceptible to *Helminthosporium victoriae*, while the other 10 vars. were resistant. When some of the F_2 were tested against both pathogens it appeared that the V gene for crown rust resistance was either pleiotropic or closely linked to the gene for susceptibility to *H. victoriae*.

Naitō (N.) & Tani (T.). [Self-inhibition in the germination of summer spores of *Puccinia coronata* on Oats.]—Abs. in *Ann. phytopath. Soc. Japan*, **24**, 1, p. 10, 1959. [Jap.]

When uredospores of *P. coronata* (crown rust of oats) were floated on distilled water at Dept Agric., Kagawa Univ., the germination rate decreased as population density increased. However, germination is noticeably promoted, even with a dense surface spore population, where the volume of water is large compared with the surface or the water is changed. Neither the influence of CO_2 and the other gases generated by the spores themselves, nor O deficiency are the main reasons for poor germination with high spore density. On the other hand, if many spores are floated for a period in a small quantity of water and the liquid alone is retained, there is a decrease in germination when a few spores are floated in it. After heating for 5 min. at 100° C. the alcohol soluble fraction from a cold water extract of dead spores, even if diluted with the original spore water, completely inhibits germination. From these results it is concluded that a self-inhibitor [cf. **38**, 306] which reduces germination is present in uredospores of *P. coronata*. [A more detailed paper (with Y. Sato) appears in *ibid.* 4, pp. 234–238, 1 fig., with Eng. summ.]

Muhammad (S.). **A study of Victoria blight of Oats in Wyoming.**—Abs. in *Publ. Univ. Wyoming*, **23**, 5, p. 107, 1959.

Twenty single-spore cultures of *H[elminthosporium] victoriae* from oats grown in Wyoming varied in cultural characteristics on potato dextrose agar. Ten of them, representing the different cultural types, produced 2 cultural types on malt extract agar: a rapid growth of grey, fluffy mycelium, consistently more virulent, and a darker, appressed, more slowly growing colony. The conidia of the former measured 47–78 × 14–17 μ and were 6-septate. Infected seedlings bore reddish-tan stripes from the 1st to the 4th leaf stages; severely affected plants died. The isolates were most virulent at 70–80° F.

Halliwell (R. S.). **Nature of influence of an isolate of Fusarium sp. and two of Chaetomium olivaceum and their staling products on Victoria blight of Oats (Helminthosporium victoriae).**—Abs. in *Publ. Univ. Wyoming*, **23**, 5, p. 79, 1959.

These fungi and their staling products were antagonistic *in vitro* to *H. victoriae* [cf. **39**, 167] and significantly controlled Victoria blight of oats in the greenhouse. Disease suppression was more marked in steamed soil with chopped lucerne added. The inhibitor was separated from the crude filtrate by paper chromatography.

Chesters (C. G. C.) & Parkinson (D.). **On the distribution of fungi in the rhizosphere of Oats.**—*Plant & Soil*, **11**, 2, pp. 145–156, 6 diag., 4 graphs, 1959.

In further studies at Univ. Nottingham [cf. **37**, 532] use was made of soil-plating [**29**, 530] and soil-box [cf. **37**, 23] techniques, the former yielding the larger number of spp. [not specified]. The rhizosphere population at an early age of the roots (of var. S 147) was dominated by Mucorales [cf. **37**, 523] (possibly owing to their dependence for growth on sugars and inorganic sources of N, easily obtainable at that stage) and by hyaline sterile mycelial forms. Later *Fusarium* spp. predominated, together with Dematiaceae, sterile dark mycelial forms, and Ascomycetes. With the onset of senescence *F. culmorum* and active cellulose-decomposing fungi, such as *Chaetomium globosum* and *Stemphylium botryosum* [*Pleospora herbarum*], became frequent. *Trichoderma viride* and *Penicillium* spp., on the other hand, occurred irrespective of the age of the plant.

Each of the zones considered, viz. tip, intermediate, and crown, displayed a similar development of its fungal population, but the number of spp. increased with age more steeply in the 2 last named and the changes started earlier in the crown zone, a fact which may be attributed to the dying-off of the root cells and a

decreased exudation of organic materials. The Mucorales-sterile mycelia community is maintained longest in the tip zone. It is concluded that the characteristics of the rhizosphere of oats result from soil changes brought about by the roots.

Knösel (D.) & Weltzien (H. C.). **Über das erstmalige Auftreten der bakteriellen Blattdürre ('halo blight') (Pseudomonas coronafaciens (Elliot) Stevens) an Hafer in Deutschland.** [On the first occurrence of bacterial leaf-withering ('halo blight') (*P. coronafaciens*) on Oats in Germany.]—*Z. PflKrankh.*, **66**, 11–12, pp. 676–680, 4 fig., 1959. [Engl. summ.]

P. coronafaciens [map 356] on oats in experimental plots at the Institut für Pflanzenschutz der Landwirtschaftlichen Hochschule, Stuttgart-Hohenheim, and on the Schwäbischen Alb, is a 1st record for Germany. Experimental infections were established on rye, wheat, barley, and oats.

Baxter (R. M.), Kandel (S. I.), & Okany (A.). **Biosynthesis of ergot alkaloids.** —*Nature, Lond.*, **185**, 4708, pp. 241–242, 1960.

At Univ. Toronto growth of a str. of *Claviceps purpurea* [cf. **38**, 729] on Abe's medium for 51 days showed a positive correlation between the age of the mycelium and the amount of alkaloid produced. Tryptophane and 5-hydroxytryptophane appeared not to be involved directly in the biosynthesis of lysergic acid alkaloids.

Trial Report West African Maize Research Unit. 1957.—40 pp., Ibadan, Starlight Press, 1959.

This report tabulates the data (including the incidence of rust [*Puccinia polysora*] and blight [*Helminthosporium turcicum*]) obtained from trials by the Unit [cf. **38**, 514].

Van Schaik (T.) & Le Roux (P. M.). **Genetic nature of some sources of resistance to leaf blight in Maize caused by Helminthosporium turcicum.** *S. Afr. J. agric. Sci.*, **2**, 2, pp. 255–259, 1959. [Afrikaans, Fr. summ.]

Studies at Univ. Pretoria showed that resistance to *H. turcicum* [cf. **35**, 588] in 10 inbred strs. of maize was polygenic in some while others contained 1 or more major genes influenced by minor modifying genes. High resistance in 1 inbred, Mex. 155 (Gto. 59–272–1–7), was attributable to 1 dominant gene.

Haunold (E.) & Neururer (H.). **Zwei für Österreich neue Blattkrankheitserreger an Mais : Helminthosporium turcicum Pass. und Helminthosporium carbonum Ullstrup.** [Two leaf disease pathogens of Maize new for Austria: *H. turcicum* and *H. carbonum*.] *PflSchBer.*, **23**, 1–2, pp. 1–26, 9 fig., 2 graphs, 1959. [Engl. summ.]

These records have already been noticed [**37**, 406]. In the laboratory, on various media, monoconidial lines of *H. turcicum* showed great variation in growth rate, but could not be defined as distinct races. Spore measurements of isolates of *H. carbonum* agreed with those of the American races I and II [**35**, 444].

Panjan (M.). **Peronospora Kukuruza.** ['Peronospora' on Maize.] *Savr. Poljopr.*, *1959*, 6, pp. 528–532, 3 fig., 1959.

A record from the Zavod za zaštitu bilja, Zagreb, of *Sclerospora macrospora* [map 287; cf. **38**, 136] on maize in some localities in Yugoslavia is presented with a brief review of the literature concerning 'crazy top' [cf. **35**, 528 *et passim*].

Kühnel (W.). **Samenübertragbare Maiskrankheiten und ihre Bekämpfung.** [Seed-borne Maize diseases and their control.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., **13**, 9, pp. 166–169, 3 fig., 1959. [Russ., Engl. summ.]

This brief review from the Biologische Zentralanstalt, Berlin, outlines control measures for all seed-borne maize diseases likely to be encountered in W. Germany

[cf. **37**, 473]. Preliminary tests indicated that against *Sphacelotheca reiliana* soil disinfection with chloronitrobenzene (phomasan 40 g./sq.m or olpisan 50 g.) was more effective than seed treatment.

Schaeffler (H.) & Schmid (G.). **Die Beizung von Maissaatgut, eine wichtige wirtschaftliche Maßnahme.** [The disinfection of Maize seed, an economically important measure.] *Pflanzenschutz*, **11**, 4, pp. 59–62, 6 fig., 1959.

It is reported from the Bayerische Landesanstalt für Pflanzenbau und Pflanzenschutz, Munich, that a quantity of Keystone 36 hybrid maize seed from America suffered heavy losses during germination in the field in 1957. Though healthy the seed was sensitive to the German climate and unable to resist certain soil organisms. Disinfection with preparations based on thiram or captan, or with a combined disinfectant containing an organic fungicide, gave good results both under glass and in the field.

Lovisolo (O.). **Hadrotrichum sorghi, the cause of a new disease of Sorghum in Italy.**—*F.A.O. Pl. Prot. Bull.*, **7**, 9, pp. 121–123, 2 fig., 1959.

H. sorghi [cf. **32**, 250] has been found to be widespread in sorghum fields in Italy, especially in Piedmont, Tuscany, and Latium. It has also been reported from Germany (Berlin Bot. Gdn.), Yugoslavia, and the Uzbek S.S.R. The hosts [loc. cit.] include *Sorghum sudanense*. The fungus produces oval spots on the leaves, extending along the veins, with a blackish centre surrounded by a light brown area and a halo, generally purple. The mycelium produces a stroma, usually on the lower leaf surface. The fungus appears to be an obligate parasite and it has not been possible to culture it. Severe infection usually occurs in very humid seasons on thickly sown fodder plants, and the damage may threaten the crop.

Control measures recommended include the elimination of *S. halepense* from the vicinity of sorghum fields, the avoidance of dense sowing, and the early cutting of severely infected fields. The development of resistant sorghums is of basic importance.

[An expanded account appears in *Boll. Staz. Pat. veg. Roma*, Ser. 3, **16** (*1958*), 2, pp. 155–182, 4 pl., 3 fig., 1 map, 1959.]

Weathers (L. G.). **The effect of host nutrition on the development of exocortis in Poncirus trifoliata.**—Abs. in *Phytopathology*, **50**, 1, p. 87, 1960.

When infected Eureka lemon on *P. trifoliata* rootstock was grown in quartz sand supplied with nutrients, max. growth occurred at 210 p.p.m. N, with marked stunting at higher levels. Development of exocortis [virus] symptoms [cf. **38**, 3] was correlated with increased N. At 1,050 p.p.m. symptoms appeared in the rootstock within 10 months of inoculation and at 630 p.p.m. within 14; at 210 and 50 p.p.m. none were seen in more than 21 months. P at 37 p.p.m. supported best growth with a little stunting above this. At 547 p.p.m. symptoms developed within 14 months; below this, there were none after more than 21 months.

Dimitman (J. E.) & Zentmyer (G. A.). **Vegetative growth of Phytophthora spp. on differential synthetic media as an aid in separating isolates pathogenic to Citrus.**—Abs. in *Phytopathology*, **50**, 1, p. 83, 1960.

Studies with various amino-acid–carbohydrate combinations indicated that on a solid medium containing maltose or dextrin +L-asparagine, salts, and vitamins *P. parasitica* produces less than $\frac{1}{7}$ the growth (dry wt. basis) of *P. citrophthora* [**39**, 310]. With a monosaccharide, such as glucose or fructose, +L-glutamine or L-glutamic acid, the opposite occurred. Other *P.* spp. fell into 3 categories, growing well on either of the amino-acids or on both; linear growth can be used for identification.

Tsao (P. H.) & Van Gundy (S. D.). **Pathogenicity on Citrus roots of Thielaviopsis basicola and its isolation from field roots.**—Abs. in *Phytopathology*, **50**, 1, pp. 86–87, 1960.

T. basicola, commonly found in citrus soils in S. Calif. [**35**, 676], markedly reduced the growth of greenhouse-grown seedlings of Homosassa orange, Keen sour orange, and Cleopatra mandarin; many other citrus spp. and vars. were susceptible. Stunting resulted from reduction of new root growth after infection of fibrous roots, which appeared dark, the fungus being confined to cortical lesions. The fungus was isolated from roots in the field by insertion of surface sterilized root pieces into slits in carrot roots and incubation for 5–7 days under moist conditions. Root infection in the field appeared to be common.

Eckert (J. W.), Kolbezen (M. J.), Whipple (F. O.), Loehr (B. F.), & Fuchs (R. J.). **Control of Citrus fruit decay with dichloroisocyanuric acid.** Abs. in *Phytopathology*, **50**, 1, pp. 83–84, 1960.

Paper sheets (11 × 17 in.) impregnated with Na dichloroisocyanurate (NaDCCA; 0·41, 0·96, 2·2, or 3·12 g.) [**38**, 597], placed in pairs in fibreboard cartons containing oranges inoculated with *Penicillium digitatum* [cf. **39**, 171], released volatile material chiefly NCl_3, which over a 15-day period reduced decay to > 50% below that of the controls. At 2·2 or 3·12 g. it also reduced sporulation on the surface of decayed fruit. Pairing NaDCCA sheets with $(NH_4)_2SO_4$ sheets improved decay control but caused fruit injury and did not control sporulation.

Liebig (G. F.), Bradford (G. R.), & Vanselow (A. P.). **Effects of arsenic compounds on Citrus plants in solution culture.**—*Soil Sci.*, **88**, 6, pp. 342–348, 2 fig., 1959.

At Univ. Calif. Citrus Exp. Sta., Riverside, lemon plants grown in solution cultures proved very sensitive to additions of As: 1 p.p.m. of As(-ate or -ite) stimulated root growth, while the former at 10 and the latter at 5 p.p.m. were definitely toxic to both roots and tops, the leaves developing vein chlorosis. These observations are of interest in relation to the problem of toxicity of As in spray residues and herbicides.

Steyle (H.) & Blanche (D.). **Les affections des Caféiers aux Antilles françaises et les remèdes à leur appliquer.** [Diseases of Coffee in the French Antilles and the remedies to apply to them.]—*Café. Cacao. Thé*, **3**, 3, pp. 134–146, 1959. [10 ref.]

After giving a key to the diseases and pests of coffee, arranged according to the symptoms on the different parts of the plant, the authors present detailed notes on the symptoms, causes, and control of virus, bacterial, and fungal diseases, including grey leaf spot (*Omphalia flavida*) [*Mycena citricolor*: cf. **37**, 354], zonate spotting of the root (*Sclerotium rolfsii*) [cf. **34**, 518], leaf spot (*Cercospora coffeicola*) [cf. **37**, 660], root rot (*Rosellinia pepo*, *R. necatrix*, *R. bunodes*, and *R. coffeicola* [cf. **34**, 518]), and pink disease (*Corticium salmonicolor*) [loc. cit.].

Eleventh Annual Report of the Research Department of the Coffee Board (1957–58).—*Bull. Indian Coff. Bd. Res. Dep.* 11, 184 pp., 6 graphs, [? 1959].

In the mycology section (pp. 89–103) [cf. **38**, 745], K. V. George gives results of comparative spray trials with various proprietary fungicides based on Cu, Hg, and S, and other organic ones against coffee leaf disease (*Hemileia vastatrix*). Again ½% Bordeaux mixture was as good as, and in some cases better than, the proprietary formulations. Various adjuvants did not significantly improve its efficacy. An initial sterilization with Bordeaux or formaldehyde followed by routine drenching of nursery soil with Bordeaux at 2-week intervals effectively controlled damping-off

and collar rot disease [*Rhizoctonia* sp.]. Brown eyespot disease (*Cercospora* spp., probably *C. coffeicola* and *C. coffeae*) does not appear to be selective in respect of the different Arabica types; 1% Bordeaux and flit 406 and dithane, both at 0·4%, gave fair control but urea did not reduce incidence.

Nursery seedlings affected by 'kondlie' disease in Aug.–Nov. had malformed stems, a constriction appearing usually at the 1st node, the stem immediately above being bulged or flattened; such as escape detection in the nursery, after transplanting to the field during Oct.–Nov. snap off at the constriction and usually die. Though *Chaetophoma* sp. and a bacterium have been invariably found associated their part is not yet known. Spraying with 0·3% flit 406 sometimes checked the disease.

Dry collar rot affected young plants in clearings 12–15 months old. The stems dry, usually 2–3 in. above soil level. The presence of *Fusarium* sp. and *Rhizoctonia* sp. was established, but inoculations have not reproduced the disease.

Stem canker, the cause of which is still unknown, was noticed on plants 12–15 months old which had canker-like depressions and ring barking with irregular margins at various levels. Target leaf spot (*Myrothecium advena*) has been described elsewhere [**38**, 598].

Bock (K. R.). **Notes on the use of captan sprays in Coffee.**—*Kenya Coffee*, **24**, 286, pp. 405–406, 1959.

Results obtained by the Coffee Berry Disease Res. Unit, Kenya, showed that captan at 4½ lb./acre in not less than 120 gal. water effectively controls coffee leaf rust [*Hemileia vastatrix*: cf. **38**, 693] if applied once in Feb., Mar., and Apr. Captan also has a generally stimulating effect on coffee trees. Cu, applied once in Oct. and once in Nov., appears to be equally effective. As the control of berry disease [*Glomerella cingulata*: cf. **38**, 518 and below] by captan is often unsatisfactory, where the disease usually causes heavy losses frequent Cu sprays are advised. It is suggested that in general planters should refrain from using captan except against leaf rust.

Bock (K. R.). **Notes on the control of Coffee berry disease.**—*Kenya Coffee*, **25**, 289, pp. 16–17, 1960.

Against coffee berry disease [*Glomerella cingulata*: cf. above] in all parts of Kenya Cu now replaces captan. Either a 50% Cu formulation or a proprietary Bordeaux mixture is used, the former at 14 lb. the latter at 40 lb./200 gal. acre. In general, 4 applications are made at intervals of 2 weeks from early or mid-Feb. to mid-March, though spray programmes vary with districts. Where severe infection or other circumstances require it, applications may also be made in mid-June and again in mid-July. The Feb.–Mar. sprays also control *Hemileia* [*vastatrix*: loc. cit.]. The cost/acre/6 applications of 50% Cu formulations, including labour, depreciation, and water transport is 352/80 *shs*. If this treatment raises the yield from 6·6 cwt. (at 400 *shs*./cwt.) for the unsprayed to 13·7 cwt./acre, the net return is 2,487 *shs*./acre.

Pickard (J. A.) & Martin (J. T.). **Spray application problems : XLVI. Mercury residues on Coffee leaves and berries in relation to the control of berry disease.**—*Rep. agric. hort. Res. Sta. Bristol, 1958*, pp. 88–93, [? 1959].

Whole berries from coffee bushes receiving 13 applications of a proprietary phenylmercuric acetate preparation (2½ lb./200 gal./acre, giving 0·003% Hg in the diluted wash) [cf. **38**, 518] during fruit development, against *Colletotrichum coffeanum* [*Glomerella cingulata*: cf. above] had an av. Hg contamination of 1 p.p.m. Much of it was located in the seeds and not much was lost when the hulled beans were roasted, but infusions contained little. The presence in young leaves of a significant amount of Hg suggests possible translocation to the newly emerging leaves.

De Lattre (R.). **Les parasites du Cotonnier à Madagascar.** [The parasites of Cotton in Madagascar.]—*Cot. et Fibres trop.*, **13**, 3, pp. 335–352, 17 pl. (2 col.), 1958.

A key is given for the determination of insect pests and of fungal and bacterial pathogens, arranged according to the phases of infection and the various organs attacked. The list includes *Penicillium* and *Aspergillus* spp., *Nematospora* [? *coryli*: cf. maps 153, 163], *Xanthomonas* [*malvacearum*: map 57], *Colletotrichum* [*Glomerella gossypii*: map 317], *Rhizoctonia* [*Corticium*] *solani*, *R. bataticola* [*Macrophomina phaseoli*], *Sclerotium rolfsii*, *Alternaria* sp., *Ramularia* [*areola*: map 260], *Kuehneola gossypii* [*Phakopsora desmium*: **36**, 730; map 258], *Diplodia* [*gossypina*], *Fusarium* [*oxysporum* f. *vasinfectum*] and other *F.* spp., and *Cladosporium* sp.

Smith (A. L.) & Dick (J. B.). **Inheritance of resistance to Fusarium wilt in Upland and Sea Island Cottons as complicated by nematodes under field conditions.**—*Phytopathology*, **50**, 1, pp. 44–48, 1 graph, 1960.

Some of the information from these studies at the agric. Exp. Sta., Ala Polytechnic Inst., Auburn, on *F. oxysporum* f. *vasinfectum* has been noticed [**32**, 252]. Wilt resistance in Upland cotton was controlled by a major dominant gene with modifying genes for *F.* resistance and additional genes for nematode resistance [cf. **38**, 320]. Of the 2 dominant genes, additive in effect, controlling resistance in Sea Island cotton, only 1 was transferred successfully to Upland.

Hassan (H. M.) & Sabet (K. A.). **Effect of infection by Xanthomonas malvacearum (E.F.S.) Dowson on respiration-rate of Cotton leaves.**—*Nature, Lond.*, **185**, 4707, pp. 177–178, 1 graph, 1960.

At Univ. Khartoum, Republic of Sudan, 3-month-old susceptible Domains Sakel plants and their resistant strs., were sprayed with 3-day-old cultures of *X. malvacearum* suspended in water. As a result the respiration of the leaves gradually decreased and reached a min. 5–7 days after inoculation in the susceptible and later in resistant strs., a phenomenon coincident with the entry of the bacteria into the stomata and their multiplication in the stomatal chambers, obstructing gas exchange. Shortly after the appearance of pinhead spots respiration began to increase: in Domains Sakel the rise coincided with the gradual enlargement of the spots and disintegration of the spot cells; in resistant strs. the spots remained at pinhead size and respiration rose to about normal after their appearance.

Last (F. T.). **Leaf infection of Cotton by Xanthomonas malvacearum (E. F. Sm.) Dowson.**—*Ann. appl. Biol.*, **47**, 4, pp. 647–657, 1 pl., 22 graphs, 1959. [16 ref.]

In further studies [**38**, 145] at the Gezira Res. Sta., Republic of the Sudan, on Egyptian and American cotton, it was found that *X. malvacearum* [**39**, 229] spread more rapidly along vascular tissue than into mesophyll when inoculated into the main veins of susceptible cotton leaves. Spread begins within 5 days of inoculation, petioles are invaded from the 10th day onwards, and by 3 weeks mesophyll infection has spread. The extent of spread varied with the inoculum conc., tissue age, and cotton var. Increasing the inoculum conc. accelerated the initial spread of the disease. In similar leaves of different ages *X. malvacearum* spread least in the oldest, the differences being most marked in the mesophyll. Initial invasion was more rapid in young leaves of young plants than in young leaves of old ones.

As judged by host reaction, Knight's resistance factors [see below] displayed 3 types of behaviour: (*a*) *X. malvacearum* spread extensively along the veins and into the mesophyll of plants containing factors B_3 and B_5; (*b*) it was confined to the inoculation site in plants containing B_4, B_9, and combinations with B_{6m}; and (*c*) it spread along the veins but not appreciably into the mesophyll of vars. containing B_2 and B_2B_3.

The evidence obtained indicated that B_2 and B_3 increase mesophyll resistance, while only B_2 appreciably increases vascular resistance. In vars. having B_2 the vascular bundles seem to be surrounded by an additional 'barrier' which resists *X. malvacearum*. Knight's factors appear to act by altering the metabolism of the host rather than its morphology [cf. **30**, 519].

Dark (S. O. S.) & Saunders (J. H.). **Shambat Station.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp.* (*Sudan*), *1958–59*, pp. 21–27, 1960.

In further experiments on blackarm (*Xanthomonas malvacearum*) [cf. **38**, 694] the only factor to reveal a differential effect between Shambat and Medani inoculum was B_5 [cf. above]. The resistance of B_2B_6 and $B_2B_3B_6$ remained as high as before. The mean blackarm grade of B_1, B_7, and B_2B_6 for the season was 1–2 grades less virulent than published values and that of B_2, B_3, and B_2B_3 was 1–3 grades higher. The systemic phase of the disease appeared in a limited area on BAR 14 25 and seemed to correspond to the height of the plant when it was sprayed with inoculum. The evidence indicates that B_3 is not a unit character. A test for boll resistance showed that B_2, B_3, B_2B_3, B_5, and B_7 gave no protection against this phase of the disease. However, B_2B_6, $B_2B_3B_6$, B_4, and B_9 were all highly resistant [**39**, 172].

Wickens (G. M.) & Logan (C.). **Plant pathology.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp.* (*Uganda*), *1958–59*, pp. 38–45, 1960.

In field seed-treatment trials at Namulonge and Serere to find the best compromise between efficiency in reducing primary and secondary infection by *Xanthomonas malvacearum* [cf. **38**, 207; **39**, 312], safety in commercial use, and cost, the efficiency of agrosan 5W at 1:150 was confirmed and in one instance it gave an increase in yield about 20% greater than at 1:300, by some means other than disease control. Armasan [cf. **36**, 458], a non-mercurial, gave about the same degree of control as agrosan 5W, but was discontinued because of the objectionable development of formaldehyde during application and storage. Spergon was again very promising.

Surveys in co-operation with the Dept Agric. showed that *Fusarium oxysporum* f. *vasinfectum* on cotton is closely associated with *Meloidogyne incognita* [cf. **38**, 320] in 2 areas in the Eastern Province. Experimental evidence confirmed the view that S47 is susceptible to *Fusarium* wilt and that its present replacements, DE 15/6 M and BP52, are more resistant.

Anthony (K. R. M.) & Ogborn (J. E. A.). **Agronomy.** Dowson (W. J.). **Abyan root rot.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp.* (*Aden*), *1958–59*, pp. 7–12, 22–25, 1960.

A field experiment showed that an apparent reduction of mortality from Abyan root rot of cotton [**38**, 208] on plots treated with D–D at 250 ml./20 sq. m. failed to approach statistical significance; 'novo' (a cresylic soil sterilizer) at 2,000 ml. and formalin at 1,375 ml. had no effect. Inoculations of cotton plants in the greenhouse at Cambridge with 3 *Phytophthora* spp. and with *Pseudomonas solanacearum* from Abyan cotton were all negative.

Serry (A.) & Eid (M. T.). **Effect of mineral deficiency on the vegetative growth and mineral content of Ashmouni Cotton.**—*Agric. Res. Rev., Cairo*, **36**, pp. 298–307, 1958. [*Chem. Abstr.*, **53**, 22, col. 22673 f, 1959.]

The leaves of N- or P-deficient plants were small, yellowish, and dry, while shortage of K caused stunting of growth, and of Mg general tissue breakdown. Chemical analyses demonstrated that N deficiency led to a decrease in P, ash, Ca, Mg, and K; P deficiency to a reduction in N, Ca, K, and ash; K deficiency to an increase in P, Ca, and Mg and a decrease in ash; and Mg deficiency to an increase in N, K, Ca, and ash, and a decrease in P.

Pietkiewicz (T. A.). **Choroba pasmo (Mycosphaerella linorum (Wr.) Garcia Rada) na Lnie włóknistym i oleistym.** ['Pasmo' disease (*M. linorum*) of fibre and oil Flax.]—*Roczn. Nauk rol.*, **78**, Ser. A, 2, pp. 269–282, 1958. [Russ., Engl. summ.]

The disease was found in 1955 for the 1st time in Poland [map 18] in an experimental field at the Instytut Ochrony Roślin, Reguły, infecting 70 of the 100 vars. inspected. Although the crop was burnt and the land deep ploughed, infection appeared again the following year, when reproduction fields of the local var. 'flax from Niedźwiadka' at Modzurów, Lower Silesia, were also affected.

Pirone (P. P.), Dodge (B. O.), & Rickett (H. W.). **Diseases and pests of ornamental plants.**—x—775 pp., 221 fig., New York, The Ronald Press Co., 1960. $10.

In this new and enlarged edition the old arrangement [cf. **23**, 438] has been retained, while recommendations for control have been revised in the light of modern developments.

Lehoczky (J.). **Biological specialization of the rust fungus Uromyces scillarum (Grev.) Wint.**—*Acta bot. Acad. Sci. Hung.*, **5**, 3–4, pp. 391–398, 3 fig., 1959.

In comparative studies at Dept Phytopath., Hort. and Vitic. Coll., Budapest, teleutospores of *U. scillarum* from 5 different hosts were found to be morphologically identical, but serial infection experiments over 4 yr., in which the tip of a dormant bulb was removed and teleutospores were introduced among the scales, showed that there are 4 biological forms (all described as new): f.sp. *hyacinthi* on *Hyacinthus orientalis*, f.sp. *muscari-comosi* on *Muscari comosum*, f.sp. *muscari-racemosi* on *Muscari racemosum*, and f.sp. *scillae* on *Scilla bifolia*.

Khan (I. U.). **Septoria chrysanthemella Sacc. on Chrysanthemum leaves.**—*Biologia, Lahore*, **5**, 1, p. 47, 1959.

A report from Lyallpur agric. Coll., Pakistan, of *S. chrysanthemella* on *C. sinense*.

Kröber (H.), Sauthoff (W.), & Maatsch (R.). **Untersuchungen über das 'Erica-Sterben'.** [Investigations of 'die-off' in *Erica*.]—*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, **11**, 9, pp. 139–141, 5 fig., 1959. [Engl. summ.]

This account [cf. **35**, 813; **37**, 239] is based on a 2-yr. study at the Institut für Zierpflanzenbau der Technischen Hochschule, Hanover, and in a N. German nursery. While the symptoms and the course of the disease varied with the season and with the age of the plants, the condition was typically a root rot followed by death of the aerial parts. Young plants often simply turned pale and died. On older plants the 1st symptom, in spring, was a check to the growth, and frequently yellowing of the leaves at the bases of the older stems. On transplanting (late Mar.–early Apr.) root formation was slow, and later, often in late June–mid Aug., the leaves bent upwards to lie close along the shoots, after which death soon occurred. When 1st symptoms appeared above ground the roots were always already partly or completely brown. *Phytophthora cinnamomi* [cf. **16**, 465; **34**, 4] was isolated most readily from the roots, but also from the collar and the lower parts of the stem. The disease was reproduced by inoculation (various methods) of healthy plants. *P. cinnamomi* was also found in 28 nurseries in various parts of Germany. Control by sanitary measures is recommended.

Patil (S. S.) & Young (R. A.). **A root disease of Fuchsia caused by Phytophthora parasitica.**—Abs. in *Phytopathology*, **50**, 1, pp. 85–86, 1960.

The disease, which occurred in a lathhouse and greenhouse near Portland, Ore., during the unusually warm summer of 1958, developed on plants inoculated and

incubated at 85° F., but not at 65° or 75°. Infection occurred at 75°, but symptoms developed only if the plants were transferred to a higher temp. No symptoms appeared on plants inoculated and incubated at 85° for 24 or 48 hr. and then moved to 75°, but plants kept for 80 hr. before transfer developed symptoms and died.

Gäumann (E.) & Kern (H.). **Sur les réactions de défense chimiques chez les Orchidées.** [On the chemical defence reactions of the Orchidaceae.]—*C. R. Acad. Sci., Paris*, **248**, pp. 2,542–2,544, 1959.

A more detailed account of these studies has been noticed [**39**, 175].

Thompson (A.). **Phytophthora palmivora—a parasite of Orchids in Singapore.**—*Malay. agric. J.*, **42**, 2, pp. 83–92, 3 pl., 1959.

The symptoms of orchid blight studied at Dept Bot., Univ. Malaya [**37**, 725], consisted of a brown rot of the leaves near the junction of leaf sheath and lamina or on parts of the latter more distant from the ensheathed stem. The str. of *P. palmivora* is regarded as close to, but not identical with the Malayan form on rubber [cf. **38**, 467]. The chlamydospores in the rotted tissues are followed by thin-walled, pyriform conidia. It is suggested that the critical factors for parasitism are 3 successive days of steady rain ($\frac{1}{2}$ in. or more daily) and absence of sunshine, particularly in the morning. Plants should be sheltered, drops of water from the leaf axils removed with blotting paper, and the plants sprayed about once a week with Cu fungicides (e.g. perenox) and insecticides. Initial disease spots distant from the leaf axil may be excised.

Bosmans (P.). **Studie van een Phomopsis sp. geisoleerd uit scheutjes van Azalea indica L.** [Study of a *P.* sp. isolated from shoots of *A. indica*.]—*Verh. Rijksst. PlZiekt. Gent* 2, 42 pp., 1 fig., 8 graphs, 1959. [Fr., Engl. summ. Cyclostyled.]

Little is known concerning this fungus, which was isolated sporadically from *A. indica* [*Rhododendron indicum*] in Belgium—in 1958 in association with *Pestalotia versicolor*, *Botrytis cinerea*, and *Gloeosporium* sp. On malt agar the *Phomopsis* forms a dense, radiating, white, later brown or black mycelium; black pycnidia up to 1 mm. diam.; A conidia which are long-ellipsoidal, containing 2 oil drops, 5–7·5 × 1·5–2 (av. 6·12 × 1·8) μ, and B conidia hyaline, walking-stick-shaped, 20–23 × 1·8–2·4 μ. In general, the culture medium consisted of 250 mg. each of KNO_3, $(NH_4)_2SO_4$, and K_2HPO_4, 20 mg. NaCl, and 15 g. agar in 1 l. tap water. In water the conidia were killed by 10 min. at 60° C. and by 2 hr. at 45°. The opt. for mycelial growth appeared to lie between 25 and 30°, with min. at 5 and max. at 35°.

Sporulation was most abundant under continuous light, which induced the production of 272 pycnidia/1·3 sq. cm. after 1 week compared with 39 in daylight, 13 in subdued daylight, and 5 in complete darkness.

Soluble starch was the best source of C for mycelial growth. The max. number of pycnidia developed in cultures supplemented by 4% (the highest conc.) carboxylmethyl cellulose (244/1·3 sq. cm.). There was no sporulation in the absence of a supplementary C source. Sporulation was increased by filtered raw and boiled seed extracts, e.g. of endive, *Scorzonera hispanica*, *Satureia montana*, and chilli (*Capsicum annuum*). The process was further stimulated by an extract of *Fusarium culmorum*.

The inclusion in the medium of not less than 1 g. P was essential for sporulation, $NH_4H_2PO_4$ being the most effective P compound.

Conidial suspensions of the *Phomopsis* infected cut leaves, shoots, and stems of *R. indicum*, *R. japonicum*, 'azalea' vars. Charlotte and Jeanette, *Ligustrum* sp., *Symphoricarpus orbiculatus*, *Cytisus purpureum* (both highly susceptible), *Pyracantha coccinea*, *Forsythia suspensa*, and *Caragana boisii*. Very little infection, however, developed in greenhouse plants of *R. indicum* inoculated during June–Aug. at 20–25°.

Rogers (M. N.). **Some effects of moisture and host plant susceptibility on the development of powdery mildew of Roses, caused by Sphaerotheca pannosa var. rosae.**—*Mem. Cornell agric. Exp. Sta.* 363, 37 pp., 2 fig., 2 diag., 1959. [56 ref.]

To determine the effects of temp. and R.H. near the surfaces of the leaves on the epidemiology of *S. pannosa* var. *rosae* [cf. **18**, 681; **38**, 699] several factors affecting the susceptibility of leaves of rose plants were studied. R.H. measurements were made 0·75 mm. from the leaf surface with a modified Dunmore electrical hygrometer [**37**, 268] and leaf temps. measured with thermocouples. R.H. on the leaf surface was varied in a temp. chamber with one refrigerated wall. When leaf and air temp. were essentially equal, transpiration was assumed to be the chief factor affecting R.H. at the leaf surface. Cuticular transpiration was of much less importance than stomatal transpiration in increasing this R.H.

When inoculated plants at 3 air R.H. levels were subjected to leaf temp. depression conditions that gave leaf R.H. values at the upper surface of 50–100%, no significant differences in the severity of powdery mildew resulted until condensation occurred on the leaves. Mildew development was restricted more by continuous water films on leaves than by discrete droplets. Intermittent mist applied immediately after inoculation inhibited all phases of mildew development, particularly spore germination. Mildew reduction appeared to be directly related to the length of exposure. Mist applied after infection was established caused no immediate reduction in mycelial development or in sporulation, but if continued for long caused the collapse of the conidia, both those detached and those remaining attached in chains.

The age of the leaf was most important and was correlated with increases in the thickness of the cuticle+epidermal cell wall. Lower leaf surfaces were more susceptible than upper, but leaves on plants raised under intermittent mist were not significantly different in susceptibility from those grown under regular greenhouse conditions. Further investigation is required of the effect of reserve carbohydrate supplies in the leaves upon susceptibility. It was concluded that R.H. in the range studied was limiting neither the incidence of rose mildew nor its severity, and it seems probable that temp. is the controlling factor in outbreaks of the disease.

Olsen (C. M.). **A Fusarium wilt of Tagetes.**—Abs. in *Phytopathology*, **50**, 1, p. 85, 1960.

A wilt of African marigold (*T. erecta*) due to *F. oxysporum* caused heavy loss in southern Calif. in Oct. 1957; many vars. were resistant. Mycelium extended to a few cm. from the growing point; 2–10% seed transmission occurred. Most vars. of China aster were susceptible to the aster [*F.o.* f. *callistephi*: cf. **30**, 108; **33**, 258] and *Tagetes* forms of the fungus; *T. erecta* was not susceptible to the aster form. A reselection of Ball White aster, resistant to aster wilt [loc. cit.], and French marigold (*T. patula*) were highly resistant to the *T.* form; dahlia, shashta daisy [*Chrysanthemum maximum*], English daisy [*Bellis perennis*], calendula, dimorphotheca, gaillardia, and zinnia were immune. Centaurea Double Blue Boy was about 45% susceptible. Pathogenicity to *T.* persisted after passage through aster or centaurea or 1½ yr. in culture. The aster and *T.* wilt fungi were morphologically similar in culture.

Sackston (W. E.) & Martens (J. W.). **Dissemination of Verticillium albo-atrum on seed of Sunflower (Helianthus annuus).**—*Canad. J. Bot.*, **37**, 5, pp. 759–768, 1 pl., 2 fig., 1959.

Sunflower seeds from diseased plants in a Winnipeg nursery, surface sterilized and plated on potato sucrose agar, gave colonies of *V. alboatrum* [**37**, 549]. The microsclerotia were confined to the hull and testa. About 50% of the infected seeds

germinated on the agar plates; the rest were apparently dead. Typical symptoms developed in plants on a plot of clean soil sown with seed from infected plants: none were found with seed from healthy plants. It is thought that seed infestation occurs probably only under favourable but as yet undetermined conditions because the pathogen was not isolated from seed of typically infected plants in the vicinity of the nursery. This lack of consistency agrees with the results of seed dissemination studies of *V. alboatrum* [**33**, 295] in other crops.

Schagen (R.). **Schmalblättrigkeit an spätausgesäten gelben Lupinen.** [Narrow leaf in late-sown yellow Lupins.]—*Z. PflKrankh.*, **66**, 11–12, pp. 685–690, 1 fig., 2 graphs, 1959. [Engl. summ.]

When several strains of yellow lupin were sown on 17 May 1958 at the Institut für Landwirtschaftliche Botanik, Univ. Bonn, 8–9% of the plants bore some leaves with mosaic symptoms at the rosette stage, and on about the 50th day all of these developed symptoms of narrow leaf. Most of the initially healthy plants, however, did not develop narrow leaf until approx. the 80th day. These symptoms agree with those described by Troll [**32**, 319] and by Hackbarth [? bean yellow mosaic virus: **39**, 112]. The present author considers, nevertheless, that the condition is generally to be attributed to unsuitable physiological conditions. In the experiment described the possibility of seed-borne virus was ruled out on the ground that symptoms did not occur on plants sown early (12 Mar.). Furthermore, the majority of the late-sown plants developed symptoms almost simultaneously, indicating a common response to physiological conditions rather than the spread of virus infection [cf. **37**, 357].

Andersen (H.). **Helminthosporium catenarium Drechs. pa graeser i Danmark.** [*H. catenarium* on grasses in Denmark.]—*Tidsskr. Planteavl*, **43**, 4, pp. 710–736, 3 fig., 1 graph, 1959. [Engl. summ.]

Since first observed in Denmark in 1948 *H. catenarium* [**38**, 55] has been regularly detected in samples of grass seed, its principal hosts being *Festuca pratensis*, *Lolium multiflorum*, and *L. perenne*, while others [loc. cit.] include *Agrostis vulgaris*.

Danish specimens of *H. catenarium* were found on comparison to be in substantial agreement with Drechsler's type material [**3**, 65], differing from *H. siccans* principally in their catenate and larger conidia (41–220 × 12–26 μ, as against 27–122 × 10–22 μ), and from *H. dictyoides* in their catenate conidia and larger conidiophores (73–378 × 8–9 μ with 2–12 septa, compared with 70–150 × 6–8 μ with 3–6). The conidia of *H.d.* var. *phlei* are formed in chains like those of *H. catenarium* but are much shorter (24–105 × 8–16 μ) and the conidial wall is thicker (1·8 compared with 1·3 μ). On the other hand, *H.d.* var. *phlei* closely resembles another *H.* sp. frequently occurring in Denmark on *Phleum pratense*.

The symptoms induced by *H. catenarium* are almost identical on its 3 main hosts, namely shrivelling of the leaf tips, marginal chlorosis, dark brown lesions with a chlorotic halo, and intervening dark brown net necroses with pronounced transverse streaks associated with chlorosis. Conidia and mycelium develop within the testa and infect the seedling, causing non-systemic infection. The best of the chemicals tested in pots and in the field was aagrano at 400 g./100 kg., but complete elimination of the pathogen was secured only by 4-hr. immersion in water at 20° C. followed by 20 min. at 51°. The av. field increase from these 2 treatments was 21–40%.

Thomason (I. J.) & Dickson (J. G.). **Influence of soil temperature on seedling blight of smooth Bromegrass.**—*Phytopathology*, **50**, 1, pp. 1–7, 4 graphs, 1960.

In further studies at Univ. Wis., Madison [**38**, 523], seed of Canadian Common brome grass (*Bromus inermis*) was sown in the winter in 2 soil types in pots and in

5 naturally infested soils (pH 5·3–5·7) of varying type and crop sequence, at opt. moisture (10% of dry wt.), 1 soil being also used to compare opt. moisture and near saturation (13·5% of dry wt.). Air and soil temps. were 28, 24, 20, and 16° C. Seedling emergence was recorded and fungi were isolated from diseased seedlings on water agar after washing the plant tissues 5–8 hr. in running water. *Pythium* spp., mostly *P. debaryanum* and *P. graminicola*, were the most abundant, followed in descending order by *Fusarium roseum*, *F. oxysporum*, *Helminthosporium sativum* [*Cochliobolus sativus*], and a number of other determined and undetermined spp. The disease was more severe at the higher temps. and soil moisture, soil temp. influencing post-emergence more than pre-emergence blight. In inoculation tests *Pythium* spp. and *C. sativus* were the most pathogenic. Seed treatment improved emergence but did not protect against post-emergence blight. The best stands were obtained in soils at 20° or less.

Western (J. H.) & Cavett (J. J.). **The choke disease of Cocksfoot (Dactylis glomerata) caused by Epichloe typhina (Fr.) Tul.** —*Trans. Brit. mycol. Soc.*, **42**, 3, pp. 298–307, 1 pl. (4 fig.), 1 graph, 1959.

At the Dept Agric., Univ. Leeds, sowing seeds of *D. glomerata* from (1) sheaves artificially contaminated with perithecial material of *E. typhina* [**33**, 726], (2) heavily infected fields, (3) inflorescences inoculated with conidia and ascospores, or (4) inflorescences the stigmas of which were directly inoculated with conidia and ascospores, suggested that the disease was not seed-borne, and data from a survey of crops of known origin supported these results. Spore trapping and other observations have shown that max. conidial production occurs rather before max. flowering and ascospores are not released in appreciable amounts until flowering is virtually over.

Under conditions of high humidity ascospores and conidia germinated on the cut surfaces of the stubble and the hyphae grew down in the pith. Infection was also obtained in the field by placing jars of ripe perithecial stromata in July along drills of seeding *D. glomerata*, some of which was cut back as in normal harvesting; the cut surfaces were also brushed with stromata and the whole area was cut back in Sept. Stromata appeared the following season.

Bradshaw (A. D.). **Population differentiation in Agrostis tenuis Sibth. II. The incidence and significance of infection by Epichloe typhina.**—*New Phytol.*, **58**, 3, pp. 310–315, 1959.

In some of 37 populations of *A. tenuis* and *A. stolonifera* sampled by tillers and grown as spaced plants at Univ. Coll. N. Wales, Bangor, the incidence of infection by *E. typhina* [**33**, 504; cf. above] was found to be remarkably high. Infection, in preventing inflorescence production, causes a considerable increase in tiller density without any other deleterious effects. This is of advantage to plants growing under conditions, such as heavy grazing or exposure, where vegetative growth is important. It is therefore concluded that such infection must be considered as a curious form of symbiosis rather than an example of parasitism.

Lloyd (A. B.). **The endophytic fungus of perennial Ryegrass.** —*N.Z.J. agric. Res.*, **2**, 6, pp. 1187–1194, 3 fig., 1959.

A survey by the Dept Agric., Palmerston North, revealed that *Lolium perenne* seed from pedigree-bred strs. contained less endophytic infection [**38**, 10] than that from long-established pastures, indicating a loss of virulence of the endophyte during storage of seed in the early stages of multiplication. Seeds of short-rotation rye grass (*L. perenne*×*L. multiflorum*) carried no endophytic fungi.

In the infected seeds the hyphae were abundant in the nucellar tissue, later, as the endosperm developed, being restricted to the layer of crushed nucellus round

the periphery of the aleurone cells. The endophyte was best cultured on whole seed of rye corn [*Secale cereale*], developing microconidia but no other spore-bearing structures.

Smith (J. H.) & Gibson (P. B.). **The influence of temperature on growth and nodulation of White Clover infected with Bean yellow mosaic virus.** —*Agron. J.*, **52**, 1, pp. 5–7, 1 fig., 1 graph, 1960.

Inoculated white clover plants [cf. **36**, 767] were grown at S. Carol. agric. Exp. Sta., Clemson, in sandy loam in environment chambers at 4 temps. In general, infection decreased both top and root growth and leaf and stolon numbers: percentage N in the roots increased, but total recoverable N in them was lower, owing to the reduction in growth. At 50° F. there were no visible symptoms in new growth and the virus had no visible effect on growth; there was less damage at 86° than at 62° and 74°. The most obvious virus symptoms coupled with max. yield reduction occurred at 62°, at which temp. the max. forage yield of virus-free plants occurred.

Rhizobia inoculation increased yields over the whole temp. range, but virus infection decreased this beneficial effect at 62° and above.

De Almeida (J. M.). **Uma grava doença ameaça a cultura do Bersim.** [A serious disease threatens the cultivation of Berseem.]—*Agricultura (Rev. Direc. Serv. agric.), Lisboa, 1959*, 2, pp. 28–29, 2 fig., 1959.

The destructive disease of *Trifolium alexandrinum* caused by *Kabatiella caulivora* [**38**, 701], associated with *Ascochyta imperfecta*, continues to spread in Portugal and the substitution of the highly resistant or immune Persian clover (*T. resupinatum*) is recommended.

Bancroft (J. B.), Moorhead (Ellen L.), Tuite (J.), & Liu (H. P.). **The antigenic characteristics and the relationship among strains of Alfalfa mosaic virus.**—*Phytopathology*, **50**, 1, pp. 34–39, 1 fig., 2 graphs, 1960. [23 ref.]

In these joint studies by Purdue Univ., Lafayette (Ind.), Univ. Neb., Lincoln, and U.S. Dept Agric., initiated because of the diversity of symptom expression by lucerne mosaic virus, 1 isolate was purified and characterized [**37**, 416] and used as an antigen, other isolates being compared serologically. The antibody responses of rabbits injected intravenously with saline suspensions of virus and intramuscularly with an emulsion of virus in 'incomplete' Freund adjuvant (mineral oil) were compared by complement fixation and ring-interface precipitin tests [cf. **36**, 314]. Strs. of the virus differing in pathogenicity and geographical origin were usually closely related serologically to the type str. Cross-reaction tests with 8 other plant viruses showed lucerne mosaic virus to be a distinct serological entity and were in agreement with the results of cross protection tests on bean [*Phaseolus vulgaris*: **39**, 177] and cowpea. Host response studies showed that the systemic reactions of different isolates of the virus on these 2 hosts are a convenient means of grouping them.

Isaac (I.) & Lloyd (A. T. E.). **Wilt of Lucerne caused by species of Verticillium. II. Seasonal cycle of disease; range of pathogenicity; host-parasite relations; effects of seed dressings.**—*Ann. appl. Biol.*, **47**, 4, pp. 673–684, 1 pl. (5 fig.), 1959.

In further studies at Univ. Coll. Swansea, it was found that *Verticillium alboatrum* and *V. dahliae* [cf. **37**, 176] from lucerne were only mildly pathogenic to hop, potato, tomato, and antirrhinum and non-pathogenic to sainfoin [*Onobrychis viciifolia*] and clover. The cultivation of potatoes after lucerne should be discouraged, particularly if lucerne is to be sown in the future. *V. alboatrum* and *V. dahliae* from lucerne, *V. alboatrum* from hop [**38**, 561], *V. tricorpus* from tomato, and

V. nigrescens and *V. nubilum* from potato differed in their effects upon lucerne seedlings growing on agar media, *V. alboatrum* being the most virulent and the only one to reach the xylem.

Agrosan GN and fernasan at 0·5 or 1% (w/w) were toxic to spores of *V. alboatrum* on lucerne seed coats and to infected plant material carried with the seed, and though toxic also *in vitro* to *Rhizobium meliloti* this did not prevent dressed seeds inoculated with it from developing into healthy seedlings bearing normal root-nodules.

Shoemaker (J. S.) & Teskey (B. J. E.). **Tree fruit production.**—viii+456 pp., 98 fig., New York, John Wiley & Sons, Inc., 1959. 56*s*. [803 ref.]

Devoting a chapt. to each crop the authors provide the latest information on the culture, production, and handling of apples, pears, peaches, cherries, plums, apricots, nectarines, quinces, and citrus fruits. Each chapt. concludes with short notes on the commoner diseases.

Vukovits (G.). **Hinweise zur Erkennung der wichtigsten Viruskrankheiten im österreichischen Obstbau.** [Hints on the recognition of the most important virus diseases in fruit cultivation in Austria.]—*Pflanzenarzt*, **12**, 6, pp. 67–69, 2 fig.; 7, pp. 78–80, 8 fig., 1959.

A popular note on symptoms, with general remarks on the principles underlying control.

Vukovits (G.). **Mehltaukuren.** [Cures for mildew.]—*Pflanzenarzt*, **12**, 10, pp. 103–106, 6 fig., 1959.

In this note from the Bundesanstalt für Pflanzenschutz, Vienna, the author comments on the heavy incidence of powdery mildews in Austria in 1959, with particular reference to those of apple (*Podosphaera leucotricha*), peach (*Sphaerotheca pannosa* var. *persicae*), and gooseberry (*S. mors-uvae*). He attributes this to a combination of the mild winters in recent years, the replacement of S by synthetic fungicides, the planting of susceptible vars., and neglect of control. Powdery mildews are readily controlled if stock is kept clean from the outset and infection not given a chance to take hold.

Vukovits (G.). **Russflecken und Fliegenschmutzfleckenkrankheit jetzt bekämpfen!** [Control sooty blotch and fly speck disease now!]—*Pflanzenarzt*, **12**, 9, pp. 97–98, 2 fig., 1959.

The Bundesanstalt fur Pflanzenschutz, Vienna, recommends late spraying with Cu formulations or captan in early Sept. in apple orchards at protected sites where the scab fungus [*Venturia inaequalis*] is still active. This should also control sooty blotch (*Gloeodes pomigena*) [cf. **36**, 250] and fly speck (*Leptothyrium pomi*).

Byrde (R. J. W.), Clarke (G. M.), Harper (C. W.), & Waugh (Nora M.). **Spraying experiments against Apple scab at Long Ashton, 1958.**—*Rep. agric. hort. Res. Sta. Bristol, 1958*, pp. 115–118, [? 1959].

In a spray trial against scab (*Venturia inaequalis*) [**37**, 46] on Worcester Pearmain bush trees, cyprex [cf. **38**, 13, 150] at 0·91 lb./100 gal. and phenyl mercury salicylanilide at 0·02 Hg/100 gal. gave promising results, reducing leaf scab by 84 and 83% and fruit scab by 87 and 72%, respectively. No phytotoxicity was observed [cf. **38**, 703], and both compounds appeared also to check a light attack of mildew (*Podosphaera leucotricha*). In these trials *o*-hydroxydiphenyl and 2:4-dichlor-6-(*o*-chloroanilino)-*s*-triazine were unsatisfactory, the former having little effect on scab and the latter causing severe fruit russet.

Kulibaba (Y. F.). Заменитель бордосской жидкости. [A Bordeaux mixture substitute.]—Защ. Раст., Москва [*Zashch. Rast., Moskva*], **4**, 6, pp. 41–42, 1959.

The Sci. Inst. for Fertilizers and Insecto-fungicides has developed a preparation consisting of 50–55% $3Cu(OH)_2.CuSO_4$, 5% sulphite liquor, 1% dextrin, and not more than 2% water. It was sprayed at 1% on 5 30-yr.-old Reinette Simirenko apple trees, in 1958 at the State farm Mikhailovskiĭ pereval, Krasnodar area, in comparison with 1% Bordeaux mixture with 5 repetitions. There was 8·4% apple scab [*Venturia inaequalis*: cf. **39**, 27] with the new preparation and 23·3% with Bordeaux.

Vinogradova (Mme N. V.). Вредоносность обыкновенного рака Яблони (возбудитель **Nectria galligena Bres.**). [The harmfulness of common Apple canker (causal agent *N. galligena*).]—Труд. Гродненск. сел.-хоз. Инст. [*Trud. Grodnensk. sel.-khoz. Inst.*], *1958*, 4, pp. 101–108, 1958. [Abs. in *Referat. Zh. Biol., 1959*, 20, p. 200, 1959.]

Anatomical studies of calluses of apple trees infected by *N. galligena* [**38**, 413, 608] disclosed a weak development of mechanical tissue in comparison with the bark of healthy trees. The prevalence of loose parenchyma in the calluses created favourable conditions for the development of *N. galligena* because of the copious nutrient substances. A considerable increase of carbohydrate content was noted in stems above cankers, though the opposite prevailed in the root. Infection of the bark and wood causes a check in translocation and a disruption of the water regime; there was weak shoot increment with correspondingly low yearly growth, yield being sharply reduced.

Sharples (R. O.). **Comparative observations on Apple shoot infections of Gloeosporium perennans and Nectria galligena.** —*Rep. agric. hort. Res. Sta. Bristol, 1958*, pp. 125–127, 1 pl. (2 fig.), [? 1959].

When no fructifications are present the cankers caused by *G.* [*Neofabraea*] *perennans* on apple trees may be confused with common canker (*Nectria galligena*). Lesions of *Neofabraea* may originate in a distal pruning wound or as cankers in lateral pruning cuts or wounds [cf. **38**, 89, 527]. The periderm splits into longitudinal strips which peel away from the swollen cortex. *Nectria* infections may originate similarly. On older branches, however, they may appear round the base of an infected lateral, or latent infections may renew their growth; the ragged, squamous appearance of older *Nectria* lesions, particularly obvious in older cankers, is quite distinct from the extensive papery peeling of periderm, characteristic of *Neofabraea* infections. Typical *Nectria* lesions in side view show a concavity around the point of infection, in contrast with the level, parallel-sided appearance of a shoot infected by *Neofabraea*.

Phellogen defence barriers, produced against both fungi, are not enough to provide a permanent barrier against *Nectria* and are successively penetrated by mycelium in branches of all ages. The limits of *Nectria* cankers are indistinct and the continued spread of the pathogen is indicated by small concentric ridges of wound wood. These distinctions, based on observations at Long Ashton, may not be reliable elsewhere where the climate and soil are different or where different strains of the fungus may be prevalent.

Corke (A. T. K.). **The effect of cover crops on the susceptibility of Cox's Orange Pippin Apples to infection with Gloeosporium perennans.**—*Rep. agric. hort. Res. Sta. Bristol, 1958*, pp. 118–124, 3 graphs, [? 1959].

In 1957 and 1958 records of the rotting of Cox's Orange Pippin fruits, picked from trees in a cover crop/manurial experiment and inoculated with *Gloeosporium* [*Neofabraea*] *perennans* [cf. above; **39**, 116], suggested a correlation between the rate of

rotting and the level of N in the trees. Grassing-down of orchards, which reduces the N level in the trees, has been shown to reduce the susceptibility of the fruits to this fungus [**37**, 47]. Increased susceptibility was found in fruits from trees under clover and 'tumble down' (natural sward) receiving additional N, though there was no difference between the mean wt. of these fruits and of those from trees receiving no additional N [cf. **38**, 266]. In 1958, however, fruits from trees under perennial rye grass and timothy, receiving extra N, rotted more slowly than those from corresponding trees given basic N.

De Haas (P. G.) & Gruppe (W.). **Die Bedeutung des Magnesiums für die Ernährung der Obstgehölze.** [The significance of magnesium in the nutrition of fruit trees.] —*Landw. Forsch.*, **12** (Suppl.), pp. 74–75, 1959.

Acute Mg deficiency symptoms in apple trees have been seen in Germany only since 1950. In the N.W. they occur in areas (*a*) containing less than 3 mg. Mg/100 g. soil; (*b*) with a high K Mg ratio (over 1 in vars. on the stock EM IX); and (*c*) on sandy soils with small amounts of exchangeable K and Mg (K/Mg under 1) accompanied by Ca deficiency and low pH. In general, apples should thrive on soils containing 10–15% Mg and 5% K, and under such conditions the annual withdrawal by robust, prolific trees of roughly 30 kg. MgO/ha. may be counterbalanced by a yearly soil amendment of 100–120 kg. K_2O ha. in the form of potash magnesia, though a period of 2–4 yr. is likely to be required for complete rehabilitation. Suggestions are given of the most suitable forms of Mg for different types of soil. Symptom development during the current year is preventable by spraying 2–5 times at 10–14-day intervals with 2% $MgSO_4$.

Hilkenbäumer (F.) & Reinken (G.). **Erkenntnisse über das Auftreten der Stippigkeit bei Äpfeln im Jahre 1958 und vorbeugende Möglichkeiten zu ihrer Vermeidung.** [Observation on the incidence of bitter pit of Apples in 1958 and possibilities of its prevention.] *Erwerbsobstbau*, **1**, 4, pp. 67–70, 1959. [43 ref.]

From a study of the literature and their own experiments at the Inst. für Obstbau, Univ. Bonn, Germany, the authors recommend measures for the prevention of bitter pit [cf. **32**, 133]: maintenance of adequate humus level in orchards; careful pruning, best restricted to thinning; fruit and branch thinning in summer; avoidance of picking non-ripe fruit; cool storage as quickly as possible after picking with the temp. kept as low as possible.

Askew (H. O.), Chittenden (E. T.), Monk (R. J.), & Watson (Joyce). **Chemical investigations on bitter pit of Apples. I. Physical and chemical changes in leaves and fruits of Cox's Orange variety during the season.** —*N.Z.J. agric. Res.*, **2**, 6, pp. 1167–1186, 1959.

Studies at Cawthron Inst., Nelson, on bitter pit of apple [cf. **37**, 487] were initiated by making chemical analyses from just after petal fall to beyond commercial maturity during 2 growing seasons. In fruit N, Ca, Mg, K, Na, and P accumulated steadily though their percentages on a fresh- or dry-wt. basis decreased; the percentage of fructose and sucrose increased rapidly, while that of glucose remained constant.

Králiková (Katarína). **Prstencovitá mozaika Hrušiek na Slovensku.** [Ring mosaic of Pear in Slovakia.]—*Pol'nohospodárstvo*, **5**, 6, pp. 1151–1159, 1958. [Russ., Engl. summ. Abs. in *Referat. Zh. Biol., 1959*, 21, p. 198, 1959.]

The dissemination of pear ring mosaic [? pear mosaic virus: cf. **35**, 831] in Slovakia is surveyed and the symptoms are described. It was observed on different pear vars. and wildlings causing light or yellow-green rings, streaks, and spots on the

leaves, and spots and corky rings on the fruit. At the Plant Protection Lab., Slovak Acad. Sci., the virus nature of the disease was demonstrated by transmission experiments. Apple is a latent carrier. Nurseries need to be kept under surveillance, especially the mother trees, which are frequently the source of infection, though symptomless.

Soule (G. H.). **Fungicide for scab, brown rot, Rhizopus.**—*Canner/Packer, 1959*, 8, p. 34, 1959.

Particulars are given of the performance in 11 States, mostly from 1955–58, of thylate, a dithiocarbamate fungicide developed by the Du Pont Company. In 1 N.Y. test the incidence of brown rot [*Sclerotinia fructicola*: **38**, 526] on sprayed peaches was only 33% compared with twice as much in plots treated with another organic fungicide and 86% in those where wettable S was used. In a S. Carol. experiment treatment with thylate resulted in the max. percentage of healthy fruit in all the trial areas, while excellent control was reported from Md on a highly susceptible var. in a season of heavy pre-harvest rains.

In N. Carol. the disease index of peaches treated against scab [*Fusicladium carpophilum*] was 6 on a 0–100 scale compared with 74 in unsprayed plots, while in S. Carol. infection was completely eliminated by thylate, as against 45% on the untreated trees and up to 15% on those to which other fungicides were applied. In Miss. scab index ratings of 4·8–6 were recorded for the thylate-treated plots compared with 31·8% in the controls.

Thylate is also effective against apple scab [*Venturia inaequalis*: **37**, 46] and most other major diseases. It leaves the fruit with a fine-quality finish at harvest and does not cause russeting. On peaches it is generally used at 1½–2 lb. 100 gal. water, but it may be applied at up to 8 times the normal conc. where infection is severe. For fruit rot control thylate should be applied at petal-fall, secondly when most of the husks have been shed, and again about a month before harvest. During the last month before harvest weekly treatments should be given where the disease is a serious problem. Treatments against scab should begin at petal-fall and continue with 3–6 cover sprays at 10–14-day intervals.

Moriondo (F.). **Primi indirizzi nella lotta contro il cancro del Pesco.** [First directions for the control of Peach canker.]—*Progr. agric.*, **5**, 12, pp. 1403–1405, 3 fig., 1959.

In Tuscany the peach var. most affected by canker (*Fusicoccum amygdali*) [**37**, 414] is Golden Jubilee; South Halven and Trionfo liscio are less susceptible. The disease was recently found near Pescia. Laboratory tests demonstrated that ferbam, ziram, and zineb were definitely toxic to the conidia. Of these, ziram was the most effective; thiram was very efficiacious also [cf. **37**, 543; **38**, 17]. Spraying according to Grosclaude's schedule [cf. **36**, 411] is recommended for Tuscany, i.e. at the beginning of budding, at flowering, at harvest, and at leaf-fall. Very severely infected plantings should be destroyed. For new plantings, healthy material only should be selected and susceptible vars. avoided.

Baxter (P.). **Treatment of manganese deficiency in Peach trees.**—*J. Dep. Agric. Vict.*, **57**, 11, pp. 704–705, 1 fig., 1959.

The leaf colour and shoot growth of peach trees with symptoms of Mn deficiency [**36**, 210], which occurs in Victoria on certain soils rich in lime and on naturally acid soils to which excessive lime has been applied, were greatly improved by all $MnSO_4$ sprays, 0·5% being slightly more effective than weaker: a spring (post fruit set) and an autumn (post harvest) spray were necessary to maintain healthy foliage on more severely affected trees. None of the early spring sprays damaged either fruit or foliage, but some fruit spotting occurred when the 0·5% spray

without lime was applied in mid-Nov. The tests were made on 25 4–5-yr.-old J. H. Hale, Wiggins, and Hale's Early trees and the symptoms scored on a scale from 0 (all leaves green) to 5 (all leaves showing chlorosis).

Baumann (Gisela). **Die Verbreitung der Stecklenberger Krankheit der Sauerkirsche und der Ringfleckenkrankheit der Süsskirsche in Obstanlagen und Baumschulen.** [The distribution of Stecklenberg disease of Sour Cherry and peach ring spot disease of Sweet Cherry in orchards and nurseries.]—*NachrBl. dtsch. PflSchDienst., Berl.*, N.F., **13**, 9, pp. 173–177, 2 fig., 1959. [Russ., Engl. summ.]

During a survey for Stecklenberg disease [? peach ring spot str.: cf. **37**, 294; **38**, 610] about 4,000 sour cherry trees in the Altmark and Borde districts and in fruit-growing areas of Saxony and Thuringia were examined in 1955–57. In several districts up to 96% of the orchard trees were infected while in nurseries 5% of the mazzard seedlings and young sweet cherry trees were infected by Stecklenberg and peach ring spot virus, respectively.

Symptoms of Stecklenberg on sour cherry are not detectable in the first 6 yr. Ring spot infection was present in 10% of trees in sweet cherry orchards. Both viruses seem to spread in the orchards.

Davidson (T. R.) & George (J. A.). **Symptoms of Sour Cherry yellows and necrotic ring spot in relation to time of inoculation.**—*Canad. J. Pl. Sci.*, **39**, 4, pp. 431–436, 1 fig., 1 graph, 1959.

At the Canada Dept Agric., every month in 1954 and 1955, 2 pairs of virus-free Montmorency sour cherry trees were inoculated by budding or patch grafting, 1 pair with cherry yellows virus and the other with necrotic ring spot [peach ring spot virus]. Shock symptoms induced by the 2 viruses were indistinguishable except that growth was more severely and longer retarded by yellows than by ringspot. The type and distribution of initial symptoms, however, varied with the time of inoculation. Four symptom patterns were distinguished, which are described in detail. Inoculation in Apr. caused shock symptoms at bud-break a few weeks later, inoculation in May–July caused shock symptoms at bud-break the following spring, as did Aug. and autumn inoculation, though the earlier inoculations gave a somewhat different symptom pattern for the 2 viruses, which appear to have a different rate of movement. If further observations indicate that these symptom patterns are constant it may enable the period when natural spread is most frequent to be defined.

Govi (G.). **La cilindrosporiosi del Ciliego.** [Cylindrosporiosis of the Cherry.]—*Ital. agric.*, **96**, 7, pp. 625–628, 6 fig., 1959.

Coccomyces [*Higginsia*] *hiemalis* was observed for the 1st time in Italy [map 58] in May 1959 on 1-yr.-old nursery plants in Lower Bologna. The symptoms and life-history of the pathogen are concisely described.

Wadley (B. N.). **Dead button, a non-transmissible disorder of late Montmorency Cherry.**—Abs. in *Phytopathology*, **50**, 1, p. 87, 1960.

This disorder was observed in Utah in 1949 and again in 1956. Necrotic areas appear at the stylar ends of small, green fruit, frequently extending to the stone and often separating from the healthy tissue at maturity, leaving a hole. Symptoms recur annually on the same trees, but the numbers of affected fruit vary.

Veenstra (M. A.) & Huguelet (J. E.). **Dormant-plant symptoms for the identification of the shoestring virus in the Burlington and Jersey highbush Blueberry varieties.**—Abs. in *Phytopathology*, **49**, 9, p. 553, 1959.

These consist of oval blotches and streaks 0·5–15 cm. long, light to brilliant red, in

contrast to the normal yellow cane surfaces of high bush blueberry [*Vaccinium corymbosum*]. Infection of a 4-acre planting was reduced from 9·36 to 0·09% in 2 yr. by roguing [cf. **39**, 182].

Zuckerman (B. M.). **Coryneum canker of highbush Blueberry.**—Abs. in *Phytopathology*, **49**, 9, p. 556, 1959.

C. microstictum causes a previously undescribed canker on *Vaccinium corymbosum* in eastern Mass., apparently favoured by adverse environmental factors. Infected stems on vigorous bushes are not killed. On poorly drained soil 57% of stems with incipient infection in spring 1957 were dead by next spring. Acervuli form in spring, often in unscalded areas on young stems, which become completely girdled. Viable spores are recovered throughout the year. Inoculation of vigorous bushes with hyphal fragments and spore suspensions resulted in infection and formation of acervuli (but not cankers) in 3 months; 7 blueberry vars. were found infected.

Labruyère (R. E.) & Nijveldt (W. C.). **Stengelziekte en stengelsterfte bij de Framboos.** [Stem disease and stem blight of Raspberry.]—*Meded. Dir. Tuinb.*, **22**, 3, pp. 168–176, 8 fig., 1959. [Engl. summ.]

The gall midge *Thomasiniana theobaldi*, which paves the way for the entrance of various fungi into raspberry canes in the Netherlands, has 3 flight periods and 3 generations a year, emergence usually beginning during the 2nd week of May. Ingress is gained through natural or artificial injuries or else through the splits which develop normally in the growing canes of all commercial vars. [cf. **32**, 86]. The scent from these sources has been proved to afford a powerful stimulus to oviposition. The larvae hatch in 5–8 days, causing a sub-epidermal flaking or peeling of the rind and a discoloration of the immediately over- and underlying tissues. Full growth is attained in 10–16 days, after which the larvae descend to the soil, pupating near the surface where 23–26 days may be spent in the summer and a much longer period in winter.

Subsequent invasion by fungi may result in the death of the canes before fruit can be borne in the following season. *Elsinoe veneta* [**37**, 243], *Botrytis cinerea*, *Didymella applanata* [**33**, 241], *Phomopsis corticis*, and *Gloeosporium* sp. can also attack the canes independently, but then the damage is confined to the cortical parenchyma. The pathogens penetrate between the pericyclar fibre bundles into the vascular tissues, traverse the xylem through the medullary rays, and reach the pith. *Leptosphaeria coniothyrium*, on the other hand, can enter only through mechanical injuries or gall midge lesions.

Effective control of cane blight involves intensive measures against *T. theobaldi*, including removal of all 1st-yr. canes during the 1st week of May to prevent oviposition and thinning of those developing later. Where the latter measure is impracticable parathion sprays should be applied at weekly intervals, beginning at the 1st sign of infestation and continuing throughout the flight periods. In the author's experiments 0·1% foliol E 605 was efficacious. In laboratory tests *Rubus caesius*, wild raspberry (*R. idaeus*), and *R. nessensis* proved suitable for oviposition and larval development, but they are not subject to splitting in the field and the midges are therefore unlikely to visit them.

Natal'ina (Mme O. B.). О стеблевом раке Малины. [On stalk rot of Raspberry.] —Защ. Раст., Москва [*Zashch. Rast., Moskva*], **4**, 5, p. 59, 1 fig., 1959.

Agrobacterium rubi [cf. **34**, 380] was found on 2-yr.-old raspberry canes in the Saratov region in 1956 and again in 1958. Another specimen was obtained in 1959 from the Leningrad region. Stocks are the main channel of spread, but the infection is retained in the soil and increases where there is no rotation. The appearance of this disease in the U.S.S.R. calls for adequate measures and a thorough study.

Jha (A.) & Posnette (A. F.). **Transmission of a virus to Strawberry plants by a nematode.**—*Nature, Lond.*, **184**, 4691, pp. 962–963, 1959.

The yellow crinkle (YC) symptoms observed at East Malling [**37**, 439] on cultivated strawberry vars. closely resemble those described [**38**, 19] for Cambridge Favourite strawberry plants affected by raspberry yellow dwarf virus (RYD: arabis mosaic virus) [**23**, 363 and below]. Inoculation experiments and serological tests indicated a close relationship between strawberry yellow crinkle virus and RYD [cf. **38**, 561]. Soil transmission of YC was confirmed when healthy plants of Cambridge Favourite strawberry and of petunia became infected when potted in soil from strawberry plantations affected by the virus, but not when potted in control soil. When samples of these soils were compared for nematode content by use of a Seinhorst elutriator, certain spp. were found to be present in both soils, but a sp. of *Xiphinema* [cf. **38**, 237] originally determined as *X. index* but now known to be an undescribed sp., was found only in the soil from the plantation infected with RYD.

In later experiments, begun in Oct. 1958, plants of Cambridge Favourite were raised in nematode-free soil in pots in an insect-free glasshouse. In experiment 1 a healthy and an infected plant were established (with intermingled roots) in each pot, while in experiment 2 no infected plants were used. As it was thought that soil texture might have some effect on the survival of the nematodes to be added, the soil used was collected from a plantation of apparently healthy plants. Cambridge Favourite plants raised in this soil before it was heat-treated remained healthy. Before use the soil was kept at 60° C. for 1 hr. which killed the nematodes. In experiment 1, 50 *Xiphinema* from an infested plantation were watered into the pots on 2 occasions, while in the 2nd 100 eelworms were added on 1 occasion. A stolon from each plant (infected and healthy) was also rooted into sterilized soil as a supplementary indicator of infection. In summer 1959 YC symptoms developed on certain of the stolons from the 'healthy' plants in the inoculated series, and later the parent plants themselves, confirmed by indexing to *Chenopodium amaranticolor* and *Petunia hybrida*, but all the controls were negative. In experiment 1, 5 of 13 plants exposed to nematodes became infected, compared with 0 of the 9 controls: for the 2nd (without infector plants) the corresponding figures were 4/10 and 0/5. It is concluded that the nematodes were essential in the transmission of the virus [see below].

Harrison (B. D.) & Cadman (C. H.). **Role of a dagger nematode (Xiphinema sp.) in outbreaks of plant diseases caused by Arabis mosaic virus.**—*Nature, Lond.*, **184**, 4699, pp. 1624–1626, 1959. [16 ref.]

It has been shown [**39**, 261] that raspberry yellow dwarf virus [**38**, 268] should be regarded as a strain of arabis mosaic virus [see above], which therefore has a much wider host-range than hitherto believed. The virus isolates used in the present investigation, jointly at Rothamsted exp. Sta. and the Scottish hort. Res. Inst., Invergowrie, Dundee, were identified serologically and were obtained from diseased raspberry plants at Methwold, Norfolk, strawberry [cf. **38**, 19] at Tenby, Pembs., and Fareham, Hants ('A' and 'B'), all exhibiting typical symptoms, and from white clover at Crewkerne, Som., with chlorotic blotches on the leaves. In all cases the virus was isolated consistently from infected plants, occurring in patches, but not from adjacent plants of normal appearance. Samples of soil were collected to determine the number of dagger nematodes present and to grow pea seedlings, subsequent root sap inoculations from which to leaves of *Chenopodium amaranticolor* gave an estimate of the infectivity of the soil. These tests proved the existence of the virus not only in medium-heavy, but also in black fen and shingle soils. All soil samples from within diseased patches were infective, and all contained *Xiphinema*, whereas soil from outside was not, and with 1 exception did not contain

Xiphinema. It appeared that if acting as vectors only a few dagger nematodes need be present to make the soil highly infective. Soil fractionation showed that the distribution of soil infectivity roughly paralleled that of the dagger nematodes. The soil fraction passing through a 160-mesh sieve was not infective. Dagger nematodes were picked out from fractionation residues with a wire handling-needle, transferred via distilled water to pots with virus-free soil, and the extract residues added to similar pots, all of which were planted with peas. After 4 weeks only plants in soil+*Xiphinema* became infected with arabis mosaic virus, not those in the soil alone, or in soil+extract residues.

In soils treated with ethylene dibromide (0·4 ml./l. soil), pentachloronitrobenzene (1 g. 20% dust/l. soil), and thiram (2 g. 10% dust/l. soil) no living dagger nematodes were found and no infection spread, while the seedlings in 8 of 12 untreated pots became infected. These chemicals appeared to have different effects on different kinds of nematodes.

Losses of crop from arabis mosaic virus can probably be avoided in raspberry by growing immune vars., such as Malling Jewel.

Miller (P. W.) & Waldo (C. F.). **The virus tolerance of Fragaria chiloensis compared with the Marshall variety.**—*Plant Dis. Reptr*, **43**, 10, pp. 1130–1131, 2 fig., 1959.

In investigations by the U.S. Dept Agric. and Ore. Exp. Sta. *F. chiloensis* was shown to possess a high degree of tolerance of most strawberry virus components present in the Pacific Northwest. All 17 clones inoculated by petiole grafting [**38**, 93] were uninjured though the viruses were recovered from inoculated plants by grafting to susceptible indicators. The same viruses caused visual leaf symptoms and a decrease in the size of the leaves of inoculated Marshall plants. *F. chiloensis* may prove a useful source of tolerance in a breeding programme.

Miller (P. W.). **An improved method of testing the tolerance of Strawberry varieties and new selected seedlings to virus infection.**—*Plant Dis. Reptr*, **43**, 12, pp. 1247–1249, 1 fig., 1959.

In further experiments [cf. above] seedlings of different strawberry vars. were inoculated by excised petiole grafts [cf. **38**, 93] from virus infected plants, placed in a moist chamber for 10 days, and then in the greenhouse at 70° F., a technique which provides for a relatively early appearance of symptoms (3–9 weeks). Certain vars. resistant to single viruses were found susceptible to infection if several virus components were applied together.

Maassen (H.). **Beiträge zur Kenntnis der Erdbeerviren.** [Contribution to the knowledge of Strawberry viruses.]—*Phytopath. Z.*, **36**, 4, pp. 317–380, 29 fig., 5 graphs, 1959. [Engl. summ. 118 ref.]

In tests with 27 strawberry vars. by leaf and stolon grafting at the Phytopathologisches Inst., Martin Luther Univ., Halle-Wittenberg, Germany, material of 5 vars. proved fully infected; another 15 had symptoms. The symptoms caused by grafting on *Fragaria vesca* were classified in 5 groups, characterized by symptoms, incubation time, and the behaviour of the virus in *Pentatrichopus fragaefolii* (not found in Eastern Germany). Symptoms in group 1 were those of a weak vein chlorotic strain of Prentice and Harris's virus 1 [strawberry mottle virus]; group 2 a mixture of strains of this virus; group 3 a complex of a virus (group 4), not yet characterized in detail, with weak and strong strains of virus 1; and a non-persistent virus (group 5) related in some features to the strawberry leaf curl [**32**, 573], necrosis [**38**, 20], and veinbanding [**35**, 29] viruses.

Acyrthosiphon pelargonii ssp. *rogersii*, which occurs frequently on strawberries in central Germany, transmitted the viruses of groups 2 and 5. *F. vesca* var.

monophylla, *F. v.* var. *semperflorens* cultivar Rügen, and *Duchesnea indica* were established as new test plants for strawberry viruses. *Potentilla adscharica*, *P. recta*, and *P. taurica* proved to be hosts of the non-persistent viruses of the strawberry mottle group. Non-persistent viruses could be inactivated by 8–11 daily heat treatments at 36·8–39·5° C.

The separation of the virus complexes of group 3 was effected by 9 days' heat treatment at 36·8°, after which 1 of 4 *F. vesca* plants produced clearly different symptoms. Similarly, a runner taken from *F. vesca* immediately symptoms appeared after graft inoculation with group 3 developed only uneven greenness of the leaves, arching of the interveinal areas, and leaf dwarfing, symptoms similar to those produced by virus of group 2 on *F. vesca* var. *monophylla* on repeated transmission.

Krczal (H.). **Untersuchungen über die Verbreitung der Erdbeerblattlaus Passerinia fragaefolii und das Auftreten von Erdbeervirosen in der Bundesrepublik.** [Studies on the distribution of the Strawberry aphid *Pentatrichopus fragaefolii* and the occurrence of Strawberry viruses in the Federal Republic.] *–Phytopath. Z.*, **37**, 1, pp. 1–20, 3 fig., 1 graph, 2 maps, 1959. [Engl. summ. 37 ref.]

Investigations at the Biol. Bundesanstalt für Land- und Forstwirtschaft, Inst. für Obstkrankheiten, Heidelberg, showed that *P. fragaefolii* [**39**, 265], the most active vector of the main strawberry viruses [see above], is present throughout the Rhine area, but in N. Germany only 1 infestation area has so far been established, in Vierlanden near Hamburg. In 230 strawberry plants of 28 cultivars from areas where this aphid does not occur virus infection was demonstrated 29 times, and in 309 plants of the same cultivars from where it is present, 187 times. In the former area the diseased plants were of both old and new vars., but in the latter they were only of old vars. or cultures introduced from abroad which, it is assumed, were infected before being imported. Two viruses, apart from 1 or 2 cases awaiting full identification, were demonstrated: isolate I, found 128 times, having an incubation time in *Fragaria vesca* of 18–21 days, and isolate II, found 59 times, an incubation time of 8–14 days. Both are non-persistent. As no complete protection from isolate II was conferred by isolate I it is assumed that they are not closely related.

Cornuet (P.) & Morand (J. D.). **Infection naturelle des Fraisiers (Fragaria sp.) par le virus de la mosaique du Tabac.** [Natural infection of Strawberries (*F.* sp.) by Tobacco mosaic virus.] *C.R. Acad. Sci., Paris*, **250**, 8, pp. 1583–1584, 1960.

By a method of pre-insolubilization involving extraction with a solution of neutralized $(NH_4)_2SO_4$, stable solutions were obtained from the leaves of the strawberry vars. Surprise des Halles, Avant-garde, and Sannier and of *F. vesca*. Electron microscope studies at the Station de Pathologie végétale, I.N.R.A., Versailles, showed some of these solutions to contain characteristic particles, 280×15 mμ, of tobacco mosaic virus, which induced typical local lesions on mechanical inoculation to *Nicotiana glutinosa*, *Datura stramonium*, and tobacco.

On *F. vesca* the symptoms induced by tobacco mosaic virus alone are weak but in association with certain strains of strawberry virus 1 [strawberry mottle virus] it is virulent, causing stunting of the petioles which turn over and level the leaflets with the ground; the latter are markedly asymmetrical owing to growth inhibition in certain parts. The inoculation of Surprise des Halles strawberry plants resulted in the development of a fine mottle visible only on the young leaves.

Davies (M. E.). **The nutrition of Phytophthora fragariae.**—*Trans. Brit. mycol. Soc.*, **42**, 2, pp. 193–200, 1 graph, 1959.

At Univ. Birmingham, using homogenized mycelium as inoculum, isolates

representing 3 physiologic races of *P. fragariae* [**35**, 112; cf. **39**, 183] were studied: isolate 10, which attacked the strawberry vars. Huxley, Perle de Prague, and Climax; 29, which attacked the first 2; and 11, pathogenic only to Huxley. The opt. Ca conc. for growth on a complex amino-acid liquid medium was 20–50 p.p.m.; Sr could partially replace Ca for 2 of the isolates, but Ba was ineffective. The Ca requirements were independent of the nature of N and C sources; glucose, maltose, sucrose, and dextrin were good C sources, but utilization of fructose, mannose, and raffinose was limited. Neither organic nor amino acids were utilized as C sources by isolate 11. Nitrate and ammonium N, even in the presence of organic acids and over a fairly wide range of initial pH values, were not used. Of 18 amino acids tested, DL-alanine, L-proline, L-asparagine, DL-serine, DL-valine, and DL-aspartic acid proved to be good N sources. Ammonium ions inhibited growth of isolate 11 when DL-alanine was the N source.

McCarthy (G. J. P.) & Teakle (D. S.). **A crown rot of Strawberry caused by Phytophthora parasitica.**—*Qd J. agric. Sci.*, **16**, 1, pp. 73–77, 1 fig., 1959.

At the Pathology Branch, Div. of Plant Industry, *P. parasitica*, reported elsewhere to induce fruit rot of strawberry (*Plant Dis. Reptr*, **37**, p. 527, 1953), was shown to be the cause of crown rot in the Phenomenal var. in Queensland. The symptoms are rapid wilting and browning (first affecting the older leaves) of mature plants, singly or in scattered groups, but the proportion of infected plants does not usually exceed 5%. Brown rot develops in the crown at the base and the advanced stages are characterized by browning of all the crown and foliage, with blackened and rotted leaves. All isolation tests showed the pathogen to be identical with *P. parasitica* from other hosts in the country. Crop rotation, and planting of resistant vars. are recommended.

Müller (H. W. K.). **Zum Auftreten und zur Bekämpfung des Erdbeermehltaues (Sphaerotheca humuli (DC.) Burr.) und der Erdbeergraufäule (Botrytis cinerea Pers.), 2. Beitrag.** [On the occurrence and control of Strawberry mildew (*S. humuli*) and Strawberry grey mould (*B. cinerea*), 2nd Part.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*) *Stuttgart*, **11**, 7, pp. 97–102, 3 fig., 1959. [Engl. summ.]

In further studies [cf. **36**, 771] at the Staatsinstitut für Angewandte Botanik, Pflanzenschutzamt, Hamburg, on the combined control of the 2 diseases the excellent effect of thiram+S was not quite equalled by lutiram [**36**, 705]+karathane, and other combinations fell further below. Intensification of control measures after harvest did not give sufficient prophylactic protection against infection the following spring. Extensive tests showed that 3 sprayings with thiram+S before harvest (including 1 during fruiting) impaired the flavour of fresh and processed fruit. As lutiram+karathane (0·25+0·05%) had no appreciable effect this combination is provisionally recommended for spraying at the beginning and end of the main flowering period and, if necessary, when fruit is green. Spraying between 2 pickings is not recommended, though at the end of flowering and particularly during ripening susceptibility to *B. cinerea* is highest.

Powelson (R. L.). **Etiology and epiphytology of Strawberry fruit rot caused by Botrytis cinerea Pers.**—*Diss. Abstr.*, **20**, 3, p. 863, 1959.

In the Pacific Northwest *B. cinerea* is responsible for over 90% of the fruit rot [cf. **37**, 698; **38**, 758]. At Oregon State Coll. viable *Botrytis* spores were trapped over and within a strawberry field throughout the year: spore density, low in Jan. and Feb., did not increase rapidly until late in the harvest period. Fructifications on mummified fruits and overwintered plant debris are a primary source of early infections. However, such sanitary measures as foliage mowing, debris removal, and

the use of winter weed sprays did not reduce incidence. Most infection originates at the stem end of the fruits, probably starting in senescent floral organs, followed by invasion of the receptacle. A high proportion of apparently sound fruits had latent infections, confined to the receptacle and associated floral organs. Plants grown under conditions favouring severe attack were less susceptible when petals, stamens, and calyces were removed shortly after fertilization. Fungicidal spraying before harvesting significantly reduced both incidence in the field and the level of latent infection in marketable fruits.

Even under relatively dry conditions the microclimate of the senescent floral organs is moist enough to permit infection, but active rotting is associated with prolonged rainy or damp weather. Incidence was increased by autumn applications of N and decreased by K. In the field the vars. Siletz and Northwest were considerably more susceptible than Marshall, but the difference was not so marked in greenhouse and laboratory experiments.

It is postulated that the rate of fruit rot development is related to the degree of water-soaking of the tissues, which affects the activity of the pectolytic enzymes produced by the fungus.

Simmonds (N. W.). **Bananas.**—xvi+466 pp., 6 col. pl., 87 photographs, 11 fig., 8 diag., 18 graphs, 3 maps, London, Longmans, Green & Co. Ltd., 1959. 45*s*.

This fascinating and very comprehensive account of the botany, cultivation, and marketing problems of the crop contains a chapt. (pp. 366–408) on diseases, with extensive information on Panama disease (*Fusarium oxysporum* f. *cubense*), leaf spot (*Mycosphaerella musicola*), and banana bunchy top virus, and short accounts of bacterial wilt (*Pseudomonas solanacearum*), finger tip diseases caused by *Verticillium theobromae*, *Helminthosporium torulosum*, and *Trachysphaeria fructigena*, and the minor viruses of infectious chlorosis [str. of cucumber mosaic virus: cf. **38**, 156] and the very similar rayadilla disease in Colombia [**31**, 562]. The literature reviewed is that published subsequently to Wardlaw's work [**14**, 322], and this chapt. is summarized and accompanied by references—a practice followed throughout the book. Recent research on Panama disease and leaf spot is most usefully surveyed, including modern methods of low-vol. oil spraying to control the latter in various countries.

Calpouzos (L.), Brun (W. A.), Theis (T.), & Colberg (C.). **A precision spray technique for evaluating oils for sigatoka disease control on individual Banana leaves in the field.**—*Phytopathology*, **50**, 1, pp. 69–72, 4 fig., 2 graphs, 1960.

A more detailed account from the Federal Exp. Sta., U.S. Dept agric., Mayaguez, Puerto Rico, of a technique used in the control of *Mycosphaerella musicola* [**39**, 183]. To discover the oil deposit range to be reproduced by the small scale spray technique a preliminary test was made in which 148 weighed squares of Al foil, 10×10 cm., were placed on banana leaves, after wiping off the dew, and reweighed after misting the leaves with oil from a 'Motoblo' sprayer. Applications of 1–3 gal./acre resulted in deposits of 1·4 4·2 mg./100 sq. cm. of leaf. Preliminary laboratory spraying of oil on to wax paper weighed before and after indicates the discharge volume of each oil necessary for a given deposit. On weighed Al foil squares under the shield (a tetrahedral muslin-covered wire frame, 2 ft. high with an open base $9\frac{1}{4}$ in. sq.) there was a somewhat higher deposit in the centre than at the edges of the sprayed surface (corners 1·79, 1·97, 1·99, and 2·07 mg./36 sq. cm., centre 2·56 mg.). Av. particle diam. of the oil was 48 μ. Several applications were made along one half of a banana leaf, the other half being left untreated as a control.

Brun (J.). **Études de l'action des fongicides huileux dans la lutte contre la cercosporiose. Action des traitements huileux sur la germination et la pénétration**

des ascospores de Mycosphaerella musicola Leach. [Study of the action of oil fungicides in the control of cercosporiosis. Action of oil treatments on the germination and penetration of ascospores of *M. musicola*.]—*Fruits d'outre mer*, **14**, 10, pp. 419–422, 1 fig., 1959.

In further studies by the Institut français de Recherches fruitières Outre-Mer, Farlaya, Guinea Republic, Cobag Plantation (Esso Plantation) oil sprayed on banana leaves to control *M. musicola* [cf. below] retarded the germination of the ascospores [cf. **38**, 534] and caused deformations of the germ tubes; these developed irregular thickenings and had less frequent septation than normal. By inoculating the leaves at various intervals after oil application it was discovered that the spray was most efficient in inhibiting stomatal penetration about 48 hr. after application and retained its protective properties for at least 1 week [cf. *Commonw. Phytopath. News*, **3**, 3, p. 44, 1957].

Philippe (J.). **La culture bananière en Guinée, en Côte d'Ivoire, et au Cameroun.** [Banana growing in Guinea, the Ivory Coast, and the French Cameroons.]—*Bull. agric. Congo belge*, **50**, 4, pp. 957–1004, 18 fig., 1959. [Flem. summ. pp. 998–1003. 21 ref.]

This paper includes a useful section (pp. 981–991) summarizing information on diseases. In the areas concerned bananas are affected by 2 major fungal diseases, sigatoka [*Mycosphaerella musicola*: cf. **37**, 545; map 7], found in all 3 territories, being present in the French Cameroons before 1940 [cf. **27**, 572], and Panama disease (*Fusarium oxysporum* [f. *cubense*]) [cf. **36**, 638; map 31], present only in the French Cameroons [but cf. **25**, 5].

The treatment against *M. musicola* recommended by Brun for the Guinea Republic consists in low-vol. mist spraying with oil+a Cu or organic fungicide (usually Cu oxychloride or zineb) [cf. **36**, 383; **37**, 492; and below]. The conc. used is 1·5–2 kg. of metallic Cu or Zn/100 l. oil, applied at 15·18 l. ha. from the ground and at 12–15 l./ha. from the air. About 30 treatments/yr. are given, 1 every 10 days in the rainy season and 1 after every 'tornado' in the dry.

In the French Cameroons 1 aerial treatment is made every 3 weeks and gives satisfactory though incomplete control [**37**, 545]. The Fontan and Solo knapsack sprayers are used for ground treatments. Capacity is about 10 l., or enough for ⅔ ha./filling. The operator must walk quickly if he is to spray at 15–18 l. ha. The average diam. of the drops is between 65–70 μ. In one plantation in the Guinea Republic 1 ground+1 aerial treatment are given every 2 weeks. In the Ivory Coast, some planters give 2 aerial treatments/yr. Aerial treatments were 1st applied early in 1957 in the French Cameroons [loc. cit.]. In the Guinea Republic where cultivation is very intensive 30 oil treatments cost 9,000 fr./ha./yr. In the French Cameroons aerial treatment once in 3 weeks costs 3,000 fr./ha./yr.; the cost of any more treatments would be prohibitive.

The Yangambi Km 5 banana appears to be resistant to *M. musicola* but is not of export quality.

Panama disease presents no problem in the Guinea Republic or in the Ivory Coast, as the vars. grown, 'dwarf' [Cavendish] and Poyo [cf. **35**, 906], are both resistant. In the French Cameroons Gros Michel plantings were first attacked in 1956 [**36**, 638]; the neighbouring plantings in the British Cameroons were affected earlier [cf. **34**, 773]. Control in the former is carried out by trenching and destroying the infected trees and replacement of Gros Michel by Poyo.

Other diseases considered are false mosaic [*Hormodendrum* sp.: **34**, 656] and *Trachysphaera fructigena* [cf. **38**, 656 and below].

Leach (R.). **Annual Report of the Banana Board Research Department, Jamaica, 1957–1958.**—44 pp., 7 graphs, 1959.

Low-vol. mechanical mist spraying with oil has proved of value in the control of

banana leaf spot (*Mycosphaerella musicola*) [cf. **38**, 22 and above] but has shown itself to be phytotoxic in Jamaica, where light brown flecking of the leaf blades has become increasingly noticeable with repeated applications. However, there appeared to be remarkably little adverse effect of oil on the grade and weight of fruit in view of the damage to stomata and tissue adjacent to vascular bundles apparent under the microscope. Two standards to measure the phytocidal properties of oil are in use: gross discoloration (yellowing) of the under surface of leaves and intensity of 'flecking' in the leaf tissue as seen by transmitted light in a dark room.

An apparently new trouble associated with oil spraying, sheath splitting, which 1st occurred where sudden growth followed after a long spell of drought, became increasingly prevalent towards the end of the wet season in 1958. Lacatan appears more susceptible than Robusta. Sometimes when only 1–1½ gal. oil are applied at 3-weekly intervals phytotoxicity is conspicuous even in the wet seasons. It is definitely worse on some soils than on others, being especially noticeable wherever plants are subject to the slightest drought, but not in well-irrigated plantations. Greater incidence in ratoons suggests that the effect of oil is cumulative. The property which causes sheath splitting may also be capable of weakening the tissues of the finger stalks and so affect shipping quality.

Comparative trials with 4 new spray oils, started by one oil company in Nov. 1957 and completed in April 1958, showed that 2 (B & C) were significantly less phytotoxic than oil A, claimed to be very similar to that used originally in Jamaica. Trials of new spray oils marketed by 3 different companies showed no difference in regard to leaf spot control or phytotoxicity. Trials were also made with 4 Cu fungicides to test the effect of Cu oxychloride from 2 sources, cuprous oxide, and Bordeaux mixture, all applied low-vol. Fortnightly applications down every row, essential for success with low-vol. mist spraying using non-eradicant fungicides, showed conclusively that this type of spraying can achieve a high standard of control even on the tallest Lacatan bananas by only 4 gal. spray mixture/acre if good control has been obtained before the wet season.

Speckle (fruit spot) is one of the most disconcerting diseases, because of its unknown cause. It increases in severity with the maturity of the fruit, which can be very seriously disfigured by it. Various treatments with N fertilizers gave no differences in the amount of speckle.

Reports on trials of more careful loading and unloading of trucks and general handling indicate a great improvement in the condition of the fruit in the U.K. ripening rooms.

Repeated observations by D. S. Meredith at ports of discharge and inside ripening rooms showed that *Gloeosporium musarum* is the most frequent fruit-rot fungus on Jamaican fruit; several *Fusarium* spp. were often associated with it. Less common were *Botryodiplodia theobromae* and *Ceratocystis paradoxa*. Fungi appearing sporadically, particularly on badly mutilated fruit, include *Mucor*, *Penicillium*, and *Rhizopus* spp. *Trachysphaera fructigena* [map 249] was found on a few Lacatan fruits after 7–9 days' ripening, but there appears to be no record of its occurrence on bananas in the W.I. Experimental inoculations readily infected wounded immature fruit, often producing advanced symptoms after 5–7 days' storage at 65–70° F., but attempts to infect sound fruit were unsuccessful. Discharge by spores from Cameroon fruit [**37**, 636] in the ripening rooms seems the most likely source of infection.

A disease similar to Wardlaw's anthracnose [**14**, 322] has occurred during recent years but the symptoms on Jamaican bananas are clearly visible on green, immature fruit of Lacatan, Robusta, and Gros Michel. Lesions are typically lenticular with the long axis parallel to that of the finger and occurred more frequently on outer fingers than on the less exposed inner ones. Later, when the fruit was turning,

lesions increased in size rapidly and in one instance an increased length of 3·6 cm. was observed after 4 days. After ripening at 65–70° F. for 9 days 96% of inoculations of immature fruit with *G. musarum* resulted in typical but small lenticular lesions. It would appear that 10–13 days are necessary for infection of healthy tissues and development of severe anthracnose symptoms; *G. musarum* is unlikely to have sufficient time for such development on sound fruit which is injured after discharge. Most of the damage arises from infections already established on arrival.

In tests to demonstrate the presence of latent infections [cf. **37**, 175] the fungus developed on 85 of the 120 cores of skin tissue isolated in 1 series. It was found that appressoria of *G. musarum* can be identified readily by microscopic examination. Apparently only a small proportion of latent infections resume activity in mature fruit [cf. **21**, 87] and will account for only a negligible amount of waste if fruit is ripened and marketed with the minimum of delay.

Lacatan fruit was found to be, in general, more prone to Santa Marta stem-end rot (Wardlaw's 'finger-stalk rot') than Gros Michel. In both vars. incidence is highest in the tip and butt hands. *G. musarum* was present in 88% of infected finger stalks and *Fusarium* spp. in 38%. It is concluded that when the former is the cause and the condition is initiated after arrival in the U.K. there is generally not time for it to develop extensively before the termination of ripening. Extensive Santa Marta stem-end rot may be caused by the fungus following injury during or after discharge, but it is so infrequent on Jamaican fruit that it is considered insignificant as a cause of waste.

Although main stalk rot, often called soft stem-end rot, can be detected in most consignments, it appears that treating severed stalk ends with polyethylene polysulphide shortly after harvesting is reasonably effective in excluding stalk-rot fungi. Those most frequently associated with this condition were *G. musarum* and *Fusarium* spp.

Meredith (D. S.). **Some observations on Trachysphaera fructigena (Tabor et Bunting) with particular reference to Jamaican bananas.**—*Rep. agric. hort. Res. Sta. Bristol, 1958*, pp. 127–131, 1 pl. (2 fig.), [? 1959].

A somewhat more detailed account of information already noticed [see above].

Stover (R. H.). **A rapid and simple pathogenicity test for detecting virulent clones of Fusarium oxysporum f. cubense using seedlings of Musa balbisiana.**—*Nature, Lond.*, **184**, 4698, pp. 1591–1592, 1959.

At the Tropical Res. Dept, La Lima, Honduras, 3-month-old seedlings of *M. balbisiana* were susceptible to *F.o.* f. *cubense* [**38**, 612], though mature wild plants in Honduras are immune. Observations in the Philippines [**36**, 320] had also shown the Pacol clone of this sp. to be susceptible to *F.o.* f. *cubense* from *M. textilis*. Of the diploid seeded *Musa* spp. seedlings of *M. schizocarpa*, *M. textilis*, and *M. acuminata* ssp. *banksii* succumbed to inoculation with *F. oxysporum* from Gros Michel. *M. balbisiana*, as a ready source of homozygous seed, was then studied further. The inoculum used came from 8 different clones of *F. oxysporum* pathogenic to *M. acuminata* (AAA) 'Gros Michel' or *M. acuminata* × *M. balbisiana* (ABB) 'Chato' or 'Bluggoe', and 5 different clones of *F. oxysporum* non-pathogenic to banana. Seedlings of *M. balbisiana* about 3 months old and 5–6 in. high were inoculated by introducing 2 g. of a 2-week-old 10% cornmeal-in-sand culture in trenches about ½ in. deep and ½ in. from the base of the rhizome, while fungus-free cornmeal-in-sand was used for the controls. After 3–6 weeks, leaf rolling and drooping followed by necrosis developed on some of the inoculated seedlings; rhizomes cut open 4–6 weeks after inoculation showed vascular discoloration, with or without above-ground symptoms, in 40–90% of the plants inoculated with clones pathogenic to Gros Michel and Chato, but not in any of those inoculated with the other clones.

Seedlings older than 3 months were more resistant, and relatively free from above-ground symptoms if affected. Contamination from one pot to another was recorded in a few cases. The use of seed for growing the test plants has obvious advantages of transport and of compliance with quarantine regulations.

Martin-Prével (P.). **Carence en potassium sur Ananas en Guinée.** [Potassium deficiency in Pineapple in Guinea.]—*Fruits d'outre mer*, **14**, 7, pp. 285–289, 5 fig.; 10, pp. 414–418, 1 col. pl., 1959. [Engl., Span., Russ., Port. summ. to 2nd paper.]

The 1st article describes studies at the Station Centrale des Cultures Fruitières Tropicales, near Kindia, Guinea Republic [cf. **34**, 734], which are summarized in the 2nd. Symptoms which were rectified by addition of K included: (1) leaves with a tendency to bend their points towards the ground; (2) a dark green bluish hue of the foliage; (3) yellow stains 1–3 mm. diam. The latter, at first visible only in transparent light, do not grow but multiply and affect almost the entire foliage as the leaves mature. Sometimes they form slight depressions under the epidermis which on the lower leaf surface become necrotic in the centre.

Zentmyer (G. A.). **Avocado diseases in Latin America.**—*Plant Dis. Reptr*, **43**, 12, p. 1229, 1959.

A list of pathogens on avocado pear [cf. **35**, 907] is given, with distributions as observed during travels to find resistance to root rot (*Phytophthora cinnamomi*), which was widespread. They included sunblotch virus [cf. **38**, 534] in Peru, *Verticillium* wilt [*V. alboatrum*] in Chile and Ecuador [map 365], and *Armillaria mellea* [map 143] in Ecuador.

Mallik (P. C.) & Hasan (S. M.). **Study on the control of anthracnose disease of Mango in Bihar.**—*Sci. & Cult.*, **25**, 5, pp. 321–322, 1959.

Mango anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: cf. **37**, 98] is becoming serious in Bihar. In a 3-yr. trial at the agric. Res. Inst., Sabour (Bhagalpur), spraying with Bordeaux mixture (1:1:30), in Aug. and again in Sept. after pruning, proved best for controlling the spread of shoot die-back. The cost per spraying is 25 n P. tree, including labour. During the 1st year spread is checked, and whatever infection remains is treated during the next rains; in this way the disease is completely controlled.

Singh (R. S.). **The occurrence of Phytophthora palmivora on leaves of Ficus religiosa.**—*Sci. & Cult.*, **25**, 6, pp. 382–384, 8 fig., 1959.

The fungus caused a serious leaf rot [cf. **30**, 216], characterized by irregular, sooty-black areas and early abscission, at Ranchi agric. Coll., Kanke, Ranchi, India.

Salerno (M.) & Romano (A). **Saggi sull'azione della streptomicina contro la 'rogna' dell'Olivo (Ps. savastanoi (Smith) Stevens), in prove 'in vitro', in serra, e in campo.** [Tests of the action of streptomycin against Olive 'knot' (*Pseudomonas savastanoi*) in experiments *in vitro*, in the greenhouse, and in the field.] —*Notiz. Malatt. Piante* 49–50 (N.S. 28–29), pp. 244–258, 1 pl., 1 graph, 1959. [Engl. summ. 21 ref.]

In vitro streptomycin even at 250 p.p.m. of a commercial product (equivalent to 110 p.p.m. of pure antibiotic) inhibited growth of *P. savastanoi* [cf. **36**, 200] appreciably for about a week. Sprayed on to young olive plants of the highly susceptible var. Morghetana in a greenhouse, however, streptomycin (250, 500, and 1,000 p.p.m. of the commercial product) had no apparent effect, whether applied before or 3 days after inoculation with *P. savastanoi*. On old olive trees in the field, streptomycin at the same 3 concs. was also ineffective. Zineb (0·3%) too was ineffective, but Bordeaux mixture (1%) gave satisfactory control.

Mueller (K. E.) & Houston (B. R.). **Symptoms of Verticillium wilt of Castor Bean.**—Abs. in *Phytopathology*, **50**, 1, p. 85, 1960.

Verticillium alboatrum was consistently isolated from plants of *Ricinus communis* affected by capsule blight in the Sacramento Valley, Calif. The cotyledons of seedlings of var. U.S. 3 384–8–6 inoculated at 2 weeks by dipping the roots in a spore suspension wilted rapidly 13–20 days later. The fungus moved up as the plant grew, remaining 1–3 nodes behind the growing point; small areas of veinal discoloration occurred on the leaves, followed by more general chlorosis and necrosis. The fungus later passed into the racemes, causing necrosis of branches and blighting of capsules. Small overgrowths on the hypocotyl and stem were due to abnormal increase in cell size and numbers in the cortex near invaded vascular bundles. There were also small islands of cell necrosis in the cortex.

Shanta (P.), Menon (K. P. V.), & Pillai (K. P.). **Aetiology of the wilt (root) disease: investigations on its virological nature.** *Indian Cocon. J.*, **13**, 2, pp. 55–66, 1960. [11 ref.]

In further studies [cf. **38**, 231] at the Central Coconut Res. Sta., Kayangulam, mechanical inoculation of 3–50-yr.-old palms induced 33–71% infection compared with 7–20% occurrence in non-inoculated controls. The disease developed within 8–9 months, with clear symptoms after 12–15 months. Palms of 6–15 yr. were the most susceptible, those of 40–50 yr. least. Following a 24 hr. feed by the banana lace-wing bug *Stephanitis typicus* on infected leaves and 24 hr. on the leaves of test trees 20–60% infection developed (control 22%). In a 23-acre plot 60–80% incidence increased over 5 yr. by 3–5% yr. Where application of manure jointly with control sprays was practised incidence decreased. In underplanted seedlings sporadic infection suggested a virus disease transmitted by insects. Samples of insects collected weekly for 10 months seemed to point invariably to *S. typicus* as a vector.

Verghese (E. J.). **Chemical studies on the leaf and root (wilt) diseases of Coconuts in Travancore-Cochin. I. Some observations of the incidence of the diseases.** —*Indian Cocon. J.*, **13**, 2, pp. 76–79, 1960.

This outline by the Central Coconut Res. Sta., Kayangulam, emphasizes erratic spread of leaf and root diseases [cf. **15**, 15] noticed in succession at Eratupettah, Meenachil; Kaviyoor and Kalloppara, Thiruvalla; and Kayangulam, localities over 30 miles distant from one another with intervening disease-free areas. In the Travancore and Cochin districts [cf. **34**, 594] diseased tracts are separated by healthy areas; and there is a high incidence in the surroundings of Kuravilangad. The presence in the same garden of healthy and infested trees with their leaves almost touching is very peculiar. The hypothesis of wind transmitting infection is corroborated by observations that spread occurs in the direction of the winds and that the incidence is higher in tracts jutting into an open space and exposed to full wind action. Severe attacks in places periodically flooded, permanently waterlogged, or with the water-table near the surface suggest that water may be involved, perhaps as a carrier of parasitic or toxic agents.

Kumari (T. O. P.), Radha (K.), & Kurien (V. C.). **Efficacy of copper fungicides with reference to Helminthosporium halodes—the leaf rot fungus of Coconut.** —*Indian Cocon. J.*, **13**, 2, pp. 70–75, 1960.

In further tests [cf. **38**, 484] at the Central Coconut Res. Sta., Kayangulam, disks of *H. halodes* agar inoculum were inserted in cavities in potato dextrose agar incorporating a fungicide (8 with 50% Cu content and 1 with 58%); only 0·4% Bordeaux mixture, 0·3% fungimar, and 0·5% Kirti copper inhibited mycelial growth completely. Germination in a thick spore suspension, mixed before solidifying

with the fungicide-treated medium (0·5 ml. 5 ml.), was prevented by 0·5% Bordeaux, and rated at 15% for 0·5% Kirti and 20% for 0·4% fungimar, the last 2 allowing a number of spores to develop germ tubes, but checking further growth. Kirti copper and fungimar at 0·1% and 0·2% sprayed on tender young leaves (10 ml. leaf) 1 hr. before spraying with 2 ml. leaf of spore suspension (containing roughly 20,000 spores) prevented infection; microcop, cupramar, fytolan, cupravit, Shell copper, Cu oil emulsion, and Sandoz blue Cu (58% Cu) prevented it at 0·25 - 0·4%.

Reestman (A. J.). **De teelt van Aardappelen bij gebruik van pootgoed met matige gezondheidstoestand.** [The cultivation of Potatoes with the use of 'seed' in a moderate state of health.] — *Landbouwvoorlichting*, **17**, 2, pp. 64–70, 3 graphs, 1960.

Owing to severe virus infection in 1959 the health of the 1960 stocks of seed potatoes in the Netherlands (especially the south) is expected to be less good than during normal seasons, with a corresponding fall in production — estimated at home and abroad at ½% for every 1% leaf roll or other serious viroses. Some recommendations, based on experiments with vars. Eigenheimer and Bintje in 1941 and 1942, are accordingly made for methods of cultivation designed to prevent such losses. They include dense planting and subsequent removal of undersized plants to give a normal number ha., using more tubers, preferably 28–35 mm. diam. rather than larger ones; heavier applications of N than usual; and careful pre-germination with elimination of poor material, e.g. spindle sprouts.

Close (R.). **The incidence of virus X in some New Zealand Potato varieties.** — *N.Z. J. agric. Res.*, **2**, 6, pp. 1137–1142, 1959.

In studies by the D.S.I.R., Christchurch, in 1958 and 1959 the field agglutination test [**34**, 55] was used to determine incidence of potato virus X [**36**, 418] in trial plots and some commercial crops [**32**, 334]. Aucklander Short Top, Dakota Red, Arran Banner, Arran Consul, and Arran Pilot were 100% infected and Chippewa and Sebago to a high degree, but incidence was low in Constellation, Southern Cross, Ulster Beacon, and Ulster Supreme, while Ilam Hardy appeared field-immune. The obvious methods of control are selection of X-free plants and production of hypersensitive or immune vars.

Völk (J.). **Zur Übertragung des Y-Virus durch Insekten und Kontakt.** [On the transmission of virus Y by insects and contact.] — *Z. PflKrankh.*, **66**, 9, pp. 563–571, 3 graphs, 1959. [Engl. summ.]

Most of the results of these experiments at the Biologische Bundesanstalt für Land- und Forstwirtschaft, Brunswick, Germany, on aphid transmission of the vein-necrosis strain of potato virus Y have been noticed [**39**, 244]. The opt. acquisition time was 2 min. The virus is also transmissible by the grasshopper *Tettigonia viridissima*.

Borges (Maria de L. V.). **O 'frisado da Valenciana' enfermidada da Batateira causada por dois virus.** ['Curl of Valenciana', a Potato disease caused by two viruses.] — *Agricultura (Rev. Direc. Serv. agric.), Lisboa*, *1959*, 2, pp. 30–32, 4 fig., 1959.

Potato viruses X and Y were shown by inoculation to *Datura metel* and *D. stramonium* and transmission by *Myzus persicae* to be jointly responsible for leaf curl of potato var. Valenciana in Portugal, a disease similar to rugose mosaic [cf. **38**, 371]. The separation of the 2 viruses was made possible by the facts that X is not transmissible by aphids and that *D. stramonium* is susceptible to X but immune from Y. Combined, the 2 viruses act synergistically, inducing much graver symptoms than are caused by either alone. Practically all stocks of Valenciana have

virus X in latent form and now comes the added risk of superimposed infection by Y. If the procurement of new, X-free clones is impracticable, growers should at least secure curl-free 'seed' by exclusion of aphids from the propagation fields and rigorous inspections to ensure the roguing of suspected plants.

[For another account of this disease by the same author see *Agron. lusit.*, **20**, 4, pp. 283–292, 3 pl. (10 fig.), 1958.]

Gold (A. H.). **A Tobacco-necrosis-like virus isolated from Potato-tuber lesions and California soils.**—Abs. in *Phytopathology*, **50**, 1, p. 84, 1960.

This virus was isolated from lesions similar to those reported from the Netherlands [**37**, 245; **39**, 337], though milder. Extracts with 0·05M K_2HPO_4 from adjacent soil and from other sandy soils and uncultivated coastal dune sand (but not from heavier soils), inoculated to Pinto bean [*Phaseolus vulgaris*], Beka bean [?], or cowpea, produced characteristic lesions. The virus appeared by the electron microscope to be a small spherical particle.

Munro (J.). **Diagnosis of Potato virus F by means of Solanum miniatum.**—*Canad. J. Bot.*, **37**, 5, pp. 903–905, 1 pl. (4 fig.), 1959.

From the Plant Path. Lab., Fredericton, N.B., the reactions of certain solanaceous spp. to inoculation with potato virus F [potato aucuba mosaic virus str.: **38**, 386] are described. Many spp. did not show symptoms and others behaved erratically, but *S. miniatum* proved a reliable indicator and was unaffected by changing environmental conditions. The symptoms, grey rings and blotches, then brown necrotic blotches, finally chlorosis and leaf drop, are much more severe and quite distinct from those caused by potato viruses A, X, and Y.

Sadovnikova (Mme V. I.), Yakovleva (Mme V. I.), Rakovich (M. I.), & Efremenko (T. S.). Подбор пар при создании ракоустойчивых сортов Картофеля. [The selection of pairings in the development of wart resistant Potato varieties.]—*J. agric. Sci., Moscow*, **4**, 12, pp. 113–117, 1959. [Engl., Germ., Fr. summ.]

Experimental data obtained during 1950–57, at the Leningrad, Chernovitsÿ, Minsk, and Vilnius sci. Res. Sta. for Potato Wart, for successive generations of potato hybrids, about 21,000 from 3,500 hybrid families, originating from 140 selected vars. and many different hybrids, are summarized. The progeny could be arranged in 5 groups for reaction to wart [*Synchytrium endobioticum*: **38**, 419; **39**, 187]. Resistant hybrids predominate in the progeny from resistant vars., but in crosses between groups containing any susceptible lines, susceptible hybrids predominate. Analysis confirms that the different lines vary in transmission of resistance to their progeny. Those giving a high proportion of highly resistant progeny were Imandra × Kameraz no. 1, 91%, Kameraz no. 1 × Priekul'skiĭ, 90%, Zven'evoĭ × Mittelfrühe, 91%, Berlichingen × Trudovoĭ, 97%, Zven'evoĭ × Katahdin, 90%, and Ost Bote × Zven'evoĭ, 92%.

Lipsits (D. V.), Khizhnyak (P. A.), & Sazonik (K. V.). Действие гамма-излучения на рак Картофеля. [The effect of gamma-irradiation on Potato wart.]—Защ. Раст., Москва [*Zashch. Rast., Moskva*], **4**, 6, pp. 47–48, 1959.

In a 2-yr. investigation at the All-Union Sta. for Potato Wart, Chernovitsÿ [**38**, 419], Co^{60} (in the form of 12 cobalt-nickel rods with a total activity of 132 millicurie on the 27 Apr. 1956) was used in a garden soil–sand mixture, infested with potato wart [*Synchytrium endobioticum*: **39**, 338] at 100 g. sporangial powder/2 kg. soil, and maintained at 40–50% moisture capacity, except during the winter when watering was reduced. Two to 12 rods were placed in each pot. At the end of a test the irradiated soil was mixed with 8 times the quantity of similar soil and potted up with potato tubers of a susceptible var. Calculations (which are described)

showed that after the 1st irradiation sporangia in the immediate vicinity of the radiation source received a dose of approx. 1,756 kr., and those at the periphery of the pot 20. After the 2nd irradiation the figures were 5,555 and 62 kr., and after the 3rd, 17,975 and 156 kr. With a dose of > 150 kr., the susceptible potato var. was not infected with *S. endobioticum*. This appears to be due to the sporangia losing the power to grow, as microscope examination showed no regular differences between irradiated and untreated sporangia. The data obtained may serve as the basis for the construction of a machine for eliminating isolated foci of *S. endobioticum*.

Poркova (Mme K. V.). Влияние бора на поражаемость Картофеля фитофторой и на развитие возбудителя болезни. [The effect of boron on *Phytophthora* infection of Potato and on the development of the causal agent of the disease.] —Бюлл. н.-т. Информ. н.-т. Инст. Картоф. Хоз. [*Byull. n.-t. Inform. n.-t. Inst. Kartof. Khoz.*], *1958*, 3, pp. 62–67, 1958. [Abs. in *Referat. Zh. Biol., 1959*, 20, pp. 198–199, 1959.]

At the Potato-growing Inst. in 1955–56 resistance of potato to *Phytophthora* [*infestans*: **38**, 220] was increased when Cu was added to the soil. B (4 kg./ha.) gave a 15% increase in yield and 1·9% increase in starch content [**37**, 592]. The influence of B on resistance in the field, in pots, and in cut clones in boric acid solution was investigated. Saccharose content, which causes the fungus to develop, was increased with B fertilizer. Conidial germination was increased 3-fold in boric acid, the largest number germinating in 0·001%. No increase in the virulence of the fungus was noted under the influence of B, but only stimulation of its development. The experiments demonstrated the effectiveness of using boric acid (3 kg./ha.) together with a similar quantity of $CuSO_4$, which neutralizes the harmful effect of B.

Gordon (C. C.), Shaw (C. G.), & Menzies (J. D.). **Morphology and host range of a subterranean member of the Meliolaceae.** -Abs. in *Phytopathology*, **50**, 1, p. 84, 1960.

This undescribed sp. produces a superficial reticulum of dark mycelium, referred to as 'black root', on the fibrous root system of potato and eggplant on irrigated land in the Columbia basin. The terminal cell of a 2-celled capitate hyphopodium produces an infection peg and the hyaline, bulbous haustoria, one or more in a cell, are confined to the epidermis. Perithecia are flask-shaped and ostiolate with a wall 2–4 cells thick. In greenhouse and field tests 44 tuber-forming and 8 non-tuber-forming spp. of *Solanum* proved susceptible; allied genera showed no infection, nor did plants in other families.

Munster (J.). **La maladie des taches de rouille de la Pomme de Terre en 1959.** [Rust spot disease of Potato in 1959.]—*Rev. rom. Agric.*, **15**, 12, pp. 97–99, 3 fig., 1959.

In Switzerland in 1959 the long dry period, broken by heavy storms, provided the marked fluctuations of soil humidity favourable to internal rust spot [cf. **38**, 95]. Fields prone to the condition should be reserved for the cultivation of fodder or industrial vars. or tolerant ones, such as Bintje, Urgenta, or Voran.

McLean (D. L.). **Some aphid vector–plant virus relationships of the feathery mottle virus of Sweet Potato.**—*J. econ. Ent.*, **52**, 6, pp. 1057–1062, 1959.

In studies with a severe strain of feathery mottle at Univ. Calif., Davis, the acquisition period for *Myzus persicae* [**37**, 505] ranged from 0–5 sec. and the inoculation threshold from 5–10 sec., while max. transmission efficiency was secured by 5 min.

pre-acquisition starving. The results of post-acquisition tests demonstrated a correlation between increase of starving time and decrease of transmission efficiency. In serial transmissions 38 of 50 aphids were infective after starvation and short feeding periods, conveying the virus to 115 of 500 plants. Analysis of the data by means of the binomial theorem supported the hypothesis that individual aphids were equally charged with the virus. *Aphis apii* and *A. gossypii* also acted as vectors of feathery mottle virus in these experiments while 6 other spp. were unable to transmit it.

Uritani (I.), Uritani (M.), & Yamada (H.). **Similar metabolic alterations induced in Sweet Potato by poisonous chemicals and by Ceratostomella fimbriata.**—*Phytopathology*, **50**, 1, pp. 30–34, 1 graph, 1960.

In further studies at Nagoya Univ., Anjo, Aichi, Japan [**37**, 418], injury to sweet potato tissue by a poison such as $HgCl_2$ caused changes very similar to those induced by inoculation with *C.* [*Ceratocystis*] *fimbriata*, namely faster respiration, increase of polyphenols and coumarins in adjacent, sound tissue, and production of ipomeamarone [**35**, 710]. Treatment of sweet potato slices with 0·1% $HgCl_2$ 3 times within 24 hr. caused production of ipomeamarone in both the injured and the adjacent tissue which did not brown. Its production, unique to this plant, would appear to be a general reaction to injury and to precede browning of the tissues after pathogenic attack.

Fassi (B.). **La lutte contre les pourridiés du Théier au Kivu.** [The control of root rots of Tea in Kivu.]—*Bull. Inform. Inst. Étud. agron. Congo belge*, **8**, 5, pp. 317–330, 1 fig., 1959.

Notes are given on the biology, ecology, and control of the root rots caused by *Rosellinia necatrix* [map 306] and *Armillaria mellea* [cf. **32**, 513; **36**, 309] (the 2 commonest parasites), *R. bunodes* [loc. cit.], and *Fomes noxius* [map 104; cf. **25**, 358], which has not been reported recently from the area. Preventive control lies in the removal of the roots of forest trees and the elimination of infected shade trees and hedges. For direct control plantings should be inspected every 3 or 4 months during the 1st few yr., diseased trees marked, the collar laid bare, and the roots of neighbouring trees examined also. A wide, deep ditch is dug round each diseased tree to facilitate complete removal of the root system and healthy roots are then covered with clean soil. All infected parts are burnt.

Shepherd (R. J.) & Pound (G. S.). **Influence of boron nutrition of Nicotiana tabacum on the multiplication of Tobacco mosaic virus.**—*Phytopathology*, **50**, 1, pp. 26–30, 2 fig., 1960.

In further studies at Univ. Wis., Madison [cf. **37**, 598], Havana 38 tobacco plants transferred at the 4- or 5-leaf stage to culture solutions containing 0 and 0·005 p.p.m. B developed deficiency symptoms in 5 and 12–14 days, respectively; they were then inoculated with tobacco mosaic virus (TMV). Virus assays of expressed sap or dried tissue showed lower concs. in plants grown without than with B (opt. level 0·5 p.p.m.) for 1–2 weeks after inoculation, but subsequently these differences disappeared and virus increased as rapidly in the deficient as in the controls, and sometimes to a higher level. TMV multiplied normally in the inoculated leaves of deficient plants, even during the 1st week, and accumulated there. Conc. in plants at 0·005 p.p.m. B did not generally differ from that in non-deficient plants at any time after inoculation.

Cole (J. S.). **Further studies of Tobacco anthracnose in Southern Rhodesia.**—*Ann. appl. Biol.*, **47**, 4, pp. 698–707, 1959.

At the Tobacco Res. Board of Rhodesia and Nyasaland, Salisbury, S. Rhodesia,

Colletotrichum tabacum [cf. **37**, 248] survived in dry soil in the laboratory for 13–17 weeks; it might, therefore, survive from one season to the next in the absence of tobacco plant residue [cf. **34**, 348]. As it was a poor competitor in moist soil the artificial watering of infected areas to be re-seeded the following season is suggested as a means of reducing soil infection.

Effective control of soil infestation was obtained with methyl bromide gas at 40·82 g. sq. yd. (1 lb. 100 sq. ft.). Of the wettable powders tested, thiram A appeared to be the most effective (more so than zineb C or maneb), no recovery of *C. tabacum* being obtained from soil given 0·56–1·13 g./sq. yd., but all were phytotoxic at certain concs. Phytotoxicity, which took the form of stunting and poor root growth, varied with different commercial formulations.

D'YACHENKO (N. N.). Методика определения устойчивости сортов и гибридов Помидоров к вирусным заболеваниям. [Methods for determining the resistance of Tomato varieties and hybrids to virus diseases.] —*Agrobiology, Moscow, 1959*, 6, pp. 912–915, 1959.

From the All-Union Inst. for Plant Protection, Leningrad, the author reviews the following methods developed at the Gribovskaya Selection Sta. for determining virus resistance [**38**, 324]: (*a*) indexing at the 1st-leaf or even the cotyledon stage; (*b*) assessment of peroxidase activity; (*c*) serological testing from the 5-leaf stage; and (*d*) terminal assessment in the field by direct observations after experimental inoculation. The indexing method is based on the inhibiting action of sap of resistant vars. on tobacco mosaic virus as determined by adding sap from the sample being tested to an equal quantity from a plant infected with tobacco mosaic virus, inoculating *Nicotiana glutinosa* leaves after 30 min., and counting the local lesions after 5 days. Tests with indoor tomatoes showed the 1st generation hybrid Patriot × Antimould to be the most resistant. There was also shown to be a direct and fairly close connexion between resistance and peroxidase activity.

CHAVES (G. M.) & COUTO (F. A. A.). **Ensaios comparativos sôbre a eficiência de fungicidas orgânicos e à base de cobre no contrôle da mela (Phytophthora infestans (Mont.) de Bary) e da septoriose (Septoria lycopersici Speg.) do Tomateiro.** [Comparative studies on the efficiency of organic and copper-based fungicides in the control of blight (*P. infestans*) and septoriosis (*S. lycopersici*) of Tomato.] —*Ceres, Minas Gerais*, **10**, 58, pp. 303–316, 1958. [Engl. summ.]

At the Escola Superior de Agricultura, Viçosa, Minas Gerais, Brazil, manzate at 0·25% was the most effective compound tested against the two diseases on tomato var. Santa Cruz in both the dry and rainy seasons of 1956 and 1957. *P. infestans* was satisfactorily combated by alternate treatments with manzate and 0·5% cuprosan or by the latter alone in dry weather.

KRÜGER (W.). **The control of Tomato canker (Corynebacterium michiganense (Erw. Smith) Jensen) by means of antibiotics.**—*S. Afr. J. agric. Sci.*, **2**, 2, pp. 195–205, 1959. [Afrikaans, Fr. summ.]

Trials with 10 antibiotics in 1956–58 at the Coll. Agric. and Exp. Sta., Potchefstroom, showed albamycin (0·025 i.u./ml.) to be the most effective in controlling *C. michiganense* [**29**, 128; **34**, 21] and to reduce infection from 80·8 and 70·4% in the controls to 19·1 and 7·4% in the 2 yr., respectively, by immersion of the roots before infection. Applied after infection it delayed the onset of wilting, which none of the others did. The other antibiotics used were apparently less stable or were translocated to the leaves too soon. All those used, however, except penicillin G, were effective (either in solution or as powders) as seed protectants against the disease.

Sokolova (Mme K. M.). Из опыта ликвидации бактериального рака Томатов в Узбекистан. [From the experiment in liquidating bacterial canker of Tomatoes in Uzbekistan.] –Защ. Раст., Москва [*Zashch. Rast., Moskva*], **4**, 6, p. 45, 1959.

As the result of concerted efforts by specialists and agricultural and scientific organizations bacterial canker of tomato [*Corynebacterium michiganense*: cf. **37**, 332] in Uzbekistan was reduced from 72 to 16% in 1954, and to 6% in 1955; since 1958 no cases have been noted in the Republic.

Mycology Branch.—*For. Res. India, 1952–53*, pp. 67–71, 1959.

In this account of the mycological work at the Forest Res. Inst., Dehra Dun, India [cf. **35**, 53], it is stated that *Polyporus shoreae* [**39**, 249] attacked about 25% of the *Shorea robusta* trees in 1 area; the disease remains latent in the finer rootlets, producing symptoms of die-back when the trees become weakened from other causes. Besides the usual form of *Fomes pini* which occurs in Europe and America [cf. **36**, 740, 798], a physiologic form was found causing heart rot of blue pine [*Pinus excelsa*: **36**, 432], spruce, and fir [*Abies*] at high altitudes in the inner Himalayas, Kashmir State; the fungus remains active on felled timber, producing fruit bodies at intervals. *Trametes serialis* and *Poria carbonica* were responsible for a widespread decay of coniferous timber in the Himalayas; also collected were *T. carbonaria*, *Trogia* sp., and *Merulius lacrymans*. *Milesia* sp. on *Pteris critica*, suspected to be the alternate state of *Peridermium cedri* on deodar [loc. cit.], was recorded in deodar forests.

Schneider (A.), Montant (C.), & Lacoste (L.). **Taphrina acerina, Exoascée nouvelle pour la France.** [*T. acerina*, Exoascaceae new for France.]—*Bull. Soc. Hist. nat. Toulouse*, **93**, 1–2, pp. 35–38, 4 fig., 1958.

The morphological characters of a fungus observed in the Valley of the Ariège, France, in June 1957, forming witches' brooms on *Acer platanoides*, agreed in the main with those described by Eliasson from Sweden (*K. svenska VetenskAkad. Handl.*, **20** (Suppl.), Sect. III, 4, pp. 3–6, 1895) and Mix [cf. **34**, 608].

Bouriquet (G.), Dadant (R.), Bassino (J. P.), & Lasoa. **Un chancre de l'écorce del l'Albizzia stipulata à Madagascar.** [A bark canker of *A. stipulata* in Madagascar.]—*Agron. trop., Paris*, **14**, 6, pp. 711–720, 7 fig., 1 graph, 1959. [Engl., Span. summ. 8 ref.]

A fatal die-back of *A. stipulata*, a shade tree in coffee plantations, results from a necrosis of the bark at the base of the trunk, at and above ground level, but before any external symptoms appear there are brown or pale chestnut, irregular areas within the bark, in which pockets of gum are often present. The areas enlarge, become confluent, and turn blackish-brown, the bark now showing the 1st outward symptoms, i.e. a black, wet, cracked appearance with the exudation of red gum, which rapidly turns brown. The gum pockets lengthen vertically and may reach a height of some dm. Some trees die rapidly, though in others the necrosis becomes arrested.

Trees of all ages are affected, but the disease occurs only in damp situations and those subject to flooding. It is particularly prevalent in plantations on reclaimed marshland on the E. coast.

From affected material *Phytophthora drechsleri* [**10**, 755] was isolated; it reproduced the canker in wounded 3-yr.-old trees. The fungus probably lives in the soil [cf. **36**, 380] and infects the trees through wounds. Control consists in painting the base of the trunk with a persistent fungicide and cutting out the canker.

Harley (J. L.) & Wilson (J. M.). **The absorption of potassium by Beech mycorrhiza.**—*New Phytol.*, **58**, 3, pp. 281–298, 9 graphs, 1959.

In experiments with excised mycorrhizal roots of beech at Dept Agric., Univ. Oxford [cf. **34**, 802], the internal K content was found to be about 70 μg. equiv./100 mg. dry tissue and that of Na about $\frac{1}{10}$ as much. Temp. above 20° C., O tensions below 3%, and low conc. of metabolic inhibitors caused loss of K. Max. absorption of K, Na, and Rb occurred at 15–20°. The rate of absorption of the alkali metals was O-sensitive, that of K falling to zero at about 3% O. Rb absorption from isotopically labelled chloride solutions did not cease in low O owing to physical equilibration of the solution with the tissues. Absorption of alkali metals was reduced by metabolic inhibitors. Absorption by roots stored in water for several days was stimulated by glucose. It is concluded that absorption of these metals is dependent on an oxidatively produced carrier.

Ozolin (G. P.). Опыт селекции Ильмовых пород на устойчивость к Голландской болезни. [An experiment in selecting Elm trees for resistance to the Dutch disease.]—*J. agric. Sci., Moscow*, **4**, 12, pp. 139–142, 1959. [Engl., Germ., Fr. summ.]

At the Central Asia sci. res. Inst. for Forestry and Forest Improvement the progeny of 40 elm mother trees from the Central Asian Republics, where there was heavy infection by *Graphium* [*Ceratocystis*] *ulmi* [**39**, 248], were inoculated with spores of the fungus. *Ulmus pinnato-ramosa*, and *U. parvifolia* were resistant, while *U. propinqua* was intermediate. The resistance of the progeny from crosses of trees belonging to the same spp. may vary. Saplings grown from open-pollinated seed with repeated inoculation were selected for resistance. The best included nos. 253, 263, 271, 360, 391, 410, 463, 489, 895, 1334, 1544, 1547, 1561, and 1565. The majority of hybrids from controlled pollination were more highly resistant than seedlings from open pollination. Hybrids in which the mother is *U. pinnato-ramosa* have much higher resistance. Saplings nos. 55, 84, 87, 195, and 1520, after repeated inoculation, were recommended for propagation. When these hybrids are crossed with one another or with the immune *U. pinnato-ramosa*, a still larger number of resistant individuals is obtained. As the result, over 2,000 trees resistant to *C. ulmi* have been grown. Biochemical studies show that resistance is characterized by a reduction of amylase activity.

Sabet (K. A.). **Studies in the bacterial diseases of Sudan crops. IV. Bacterial leaf-spot and canker disease of Mahogany (Khaya senegalensis (Desr.) A. Juss. and K. grandifoliola C. DC.).**—*Ann. appl. Biol.*, **47**, 4, pp. 658–665, 1 pl., 1959.

This disease, studied at Univ. Khartoum, Republic of the Sudan, is confined to certain areas, infections appearing on the leaves as minute, dark green, shining spots on the lower surface. In the relatively dry Khartoum Province the spots on *K. senegalensis* reach 3–4 mm. diam. and have a narrow, irregular, shining, dark green margin and round, yellow, raised, scabby centres on the lower surface. On the upper surface they become dark brown or purple and are slightly raised. The spots on *K. grandifoliola* in the same region become dark red on both surfaces, but on the lower are rough, though not raised or scabby. In the central rainlands the spots on both spp. are 5–8 mm. diam., with broad, dark green, glossy, shining margins, which slowly become brownish, and minute, yellow (on *K. senegalensis*) or red (*K. grandifoliola*), slightly raised centres. In all cases the spots may coalesce into large blotches. Severely affected leaves wither and drop. Infections increase during the rainy season and are arrested in dry weather.

On the petioles and midribs yellowish-green, later yellow, minute, soft, oval blisters up to 0·8 cm. long develop and may coalesce into one long, constricted lesion. The blisters dry and become rough and reddish-brown on both spp. On

branches up to 6–7 yr. old, small, knob-like cankers a few mm. diam. form and may be numerous enough to give affected branches a knobbly appearance. They dry after the rainy season.

Infection of the leaves takes place through the stomata in any season. In inoculation experiments typical shoot infections resulted only when young, green shoots were rubbed with the bacterium, isolated from affected leaves and young branches. It is described and is considered to be a new sp. of *Xanthomonas*, for which the name *X. khayae* Sabet is proposed.

Viswanathan (T. S.). **A new species of Mycosphaerella from India.**—*Mycopathologia*, **12**, 2, pp. 156–158, 1 fig., 1960.

On leaves of mulberry growing near Poona, the author found a new *Mycosphaerella* sp. with hyaline, 1–2 seriate, 1-septate ascospores 9–12 × 2 μ, which is named *M. indica* Visw.

Wilson (C. L.). **Penetration and invasion of Ceratocystis piceae in White Oak wood.**—*Mycologia*, **51**, 3, pp. 311–317, 13 fig., 1959.

In a study at Dept Plant Path., Univ. Ark., Fayetteville, of the mode of penetration and invasion of *C. piceae* [cf. **38**, 719] in white oak [*Quercus alba*] wood stained by the beetle *Corthylus columbianus* and adjacent to its galleries, it was ascertained that the growth of the fungus is mostly intracellular and primarily confined to vertical xylem parenchyma and uniseriate-ray cells. The large medullary rays were not invaded. *C. piceae* appears to be able to penetrate the cells only through pits. Penetration of the membrane between simple pit-pairs usually involves the formation of appressoria, whereas penetration of the membrane between bordered and half-bordered pit-pairs does not. The fact that the fungus did not enter the medullary-ray tissue even when a gallery passed through it is considered to indicate that the resistance of this tissue to *C. piceae* is physiological.

Dance (B. W.). **A cultural connection between Venturia tremulae Aderh. and its imperfect stage in Ontario.**—*Canad. J. Bot.*, **37**, 5, pp. 1139–1140, 1959.

At Forest Path. Lab., Maple, Ont., ascospores of *V. tremulae* from a blighted, overwintered shoot of trembling aspen (*Populus tremuloides*) germinated on malt agar to produce conidial colonies identical with the prevalent N. American hyphomycete usually called *Napicladium tremulae* or (more correctly) *Fusicladium tremulae*. The writer believes, however, that the fungus may be a var. of *Pollaccia radiosa*.

Bier (J. E.). **The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. 2. Fusarium canker on Black Cottonwood. 3. Cephalosporium canker on Western Hemlock.**—*Canad. J. Bot.*, **37**, 5, pp. 781–788, 3 pl. (11 fig.), 3 graphs; pp. 1140–1142, 1 pl. (5 fig.), 1959.

More detailed studies [**39**, 130] on bark moisture of *Populus trichocarpa* in relation to development of cankers caused by *F. lateritium* [*Gibberella lateritia*] in the Fraser Valley, B.C., are reported from Univ. B.C. Canker development continued through the dormant season of 1957–58, during which monthly av. temp. was higher than the min. temp. for the growth of the causal fungus on potato dextrose agar, and the relative turgidity was below 80%. During the growing season the temp. was still favourable, but the relative turgidity, above 80%, prevented further canker development.

The information in the 2nd paper has been noticed [**39**, 130].

Diercks (R.). **Zur chemischen Bekämpfung der Korbweiden-Parasiten Fusicladium saliciperdum (All. et Tub.) Lind. und Glomerella miyabeana (Fuk.) v. Arx.** [On

chemical control of the Basket Willow parasites *Pollaccia saliciperda* and *Physalospora miyabeana*.]—*Pflanzenschutz*, **11**, 9, pp. 125–130, 132, 4 fig., 1959.

Following a 2-yr. trial by the Bayerische Landesanstalt für Pflanzenbau und Pflanzenschutz, Munich, weekly sprayings (300 l./ha.) with captan+brestan (each 0·15%) or with zineb (0·4%) commencing in June–July (at the latest with the appearance of the 1st lesions) are recommended against *Pollaccia saliciperda* [**37**, 252] and *Physalospora miyabeana* [cf. **36**, 561] on basket willows [*Salix* spp.]. Brestan (0·3%) alone, though more highly efficient as a fungicide, was phytotoxic. The effectiveness of zineb—brestan, and of captan alone, is to be investigated. The rapid growth of the shoots necessitates intervals of 1 week rather than 2 for effective control. Knapsack sprayers are suitable for this work. Captan+brestan raised the value of the crop 1,472 DM. ha. (i.e. by well over 100%), compared with 1,151 for zineb and 995 for brestan.

Bega (R. V.). **The effect of environment on germination of sporidia in Cronartium ribicola.**—*Phytopathology*, **50**, 1, pp. 61–69, 3 fig., 6 graphs, 1960. [15 ref.]

In further studies at Univ. Calif., Berkeley [cf. **38**, 393], using a similar technique for the discharge of sporidia on to various substrates and agar blocks carrying primary sporidia for the production of secondary sporidia and so on, the sporidia were subjected to various conditions in the climate-control mycotron. Primary sporidia were able to produce up to 6 successive generations of sporidia, the 4th–6th being of minor importance in disease spread, but the 2nd and 3rd sufficiently abundant to play an appreciable part.

Exposure of sporidia to 770 ft. c. of light or to darkness for 24 hr. at 15° C. on 1·5% water agar at pH 6·6 caused little difference in germination. Primary sporidia germinated over a pH range of 3–11 (opt. 3) for direct germination and 7–9 for indirect (i.e. formation of secondary and subsequent sporidia); opt. for germ tube elongation was 4; secondary sporidia behaved similarly. Germination was tested on 2% water agar at 2 pH levels over 0·5–28°. It took place at 0·5–1°–24° at pH 6·8 and to 28° at pH 4. At higher temps. sporidia were more vigorous at pH 4 after 6 hr. than at 6·8 after 24 hr. At all temps. direct rather than indirect germination was favoured at pH 4.

Sporidia germinated on needles of *Pinus lambertiana* at 0·5–1°–28°, often producing 2–3 germ tubes spore and these branched in turn. Germ tubes increased in length up to 16 20° and were shorter (4·2 μ) at 28°. Few secondary sporidia formed on the needles. On 8 other conifers, including 5 other spp. of white pine, vigour of germination was similar, but while on the white pines no indirect germination was seen, on white fir (*Abies concolor*) it was notably high (20%).

Jewell (F. F.). **Inoculation of Slash Pine seedlings with Cronartium fusiforme.**—*Phytopathology*, **50**, 1, pp. 48–51, 9 fig., 1960.

At Southern Forest Exp. Sta., Gulfport, Miss., 30-day-old cotyledonary seedlings of *Pinus elliottii* in nursery beds were inoculated with *C. fusiforme* [**38**, 629] by placing telia-bearing oak leaves above them under single- or double-frame canvas tents kept constantly moist to maintain high R.H. for 72 hr. [cf. **27**, 267]. There was a close correlation between needle spotting and subsequent gall development. Alternatively, the new flush on 1-yr.-old pines was wrapped with infected oak leaves either under absorbent cotton kept moist for 72 hr., or in a moist atmosphere in a lath house. Of 2 lots of 40 plants so inoculated 30 and 21, respectively, became infected. Some success was also obtained by inserting telia-bearing pieces of oak leaves into slits in the stem, but spraying with a suspension of sporidia gave no infection.

Vámos (R.) & Vida (L.). **Antibacterial substances of coniferous seedlings at different stages of their development.**—*Nature, Lond.*, **184**, 4690, p. 915, 1959.

To discover why damping-off ceases to affect pine seedlings [**34**, 760] after the appearance of the foliage leaves, even under conditions conducive to fungal attack, antibiotic substances in seedlings of *Pinus sylvestris* and *P. nigra* were studied by the diffusion method at the Lab. of State Forestry, Szeged Radai, Hungary. Using *Fusarium oxysporum* and other fungi and bacteria isolated from dead pine seedlings as test organisms it was shown that the seedlings contained no antimicrobial substances before the appearance of the foliage leaves, and that a substance extracted after this inhibited Gram+bacteria but not fungi, which suggests that the Gram+bacteria play a part in the damping-off.

Eades (H. W.) & Roff (J. W.). **Red heart stain of Lodgepole Pine logs in the southern interior of British Columbia.**—11 pp., (V-1025) Forest Products Laboratories of Canada, Vancouver Lab., 1959. [14 ref. Cyclostyled.]

During examination of portions of logs and tops of *Pinus contorta* var. *latifolia* felled during logging, *Fomes pini* was isolated from 66% of samples with red heart stain [**36**, 800; **38**, 551] and all of the advanced decay was caused by this fungus. Other fungi isolated were *Stereum pini* (12%), *S. sanguinolentum* (9%), and *Polyporus tomentosus* (3%). *Rhinocladiella atrovirens* [**38**, 460] was the only imperfect fungus which caused red stain in laboratory samples and is believed to be a new host record. Branch stubs were the usual point of entry for *S. pini* (90%) and *F. pini* (60%), while 30% of infections caused by each of the other 2 fungi were from trunk scars, usually near the butt. These studies indicate that the stain may be attributed mainly to 3 fungal spp., of which *S. pini* and *F. pini* vary considerably in regional distribution.

Roldan (E. F.). **Hyphal penetration of the staining fungus Ceratostomella sp. in Rattan and its significance in controlling stain.**—*Philipp. J. Sci.*, **87**, 1, pp. 37–43, 1 pl. (3 fig.), 2 graphs, 1958. [Received Jan. 1960.]

Studies at the Forest Products Res. Inst. Coll., Laguna, showed that *Ceratostomella* sp. readily infects rattan, entering through the ends of freshly cut poles but penetrating only little during the 1st 12 hr. following infection. Treatment by dipping for 2 min. in 0·84% sodium pentachlorophenate (dowicide G) within this period is important because growth of the fungal hyphae is rapid, penetration extending up to 51 mm. longitudinally 24 hr. after infection and up to 245 mm. after 7 days [cf. **21**, 435].

Shaltÿko (G. E.), Pshedetskaya (Mme L. I.), & Sergeenkova (Mme K. K.). **Sodium thiosulphate for the antiseptic impregnation of wood.**—*Zh. prikl. Khim., Leningr.*, **32**, 7, pp. 1629–1632, 1959. [*Chem. Abstr.*, **53**, 22, col. 22685e, 1959.]

At the Inst. of Engineers and Railroad Transport, Leningrad, samples impregnated with $Na_2S_2O_2$ or water were treated with 3% $CuSO_4$, washed with tap water, dried to constant wt. at 100–105°, and tested in a culture of *Coniophora cerebella* [*C. puteana*]. When initially saturated with 0·6 *N* $Na_2S_2O_2$ the wood was completely protected, whereas the loss in wt. from decay in specimens treated with water were 45·7 and with $CuSO_4$ 16·7.

Viroses des plantes légumières. [Virus diseases of vegetables.] Cornuet (P.). **Maladies à virus et méthodes de lutte.** [Virus diseases and control methods.] Marrou (J.). **La mosaïque de la Laitue.** [Lettuce mosaic.] Devergne (J.-C.). **Les virus des Pois et des Haricots.** [Pea and Bean viruses.] Spire (D.). **Les**

viroses des Cucurbitacées. [Virus diseases of the Cucurbitaceae.] CORNUET (J). **La résistance des Haricots aux maladies à virus.** [The resistance of Beans to virus diseases.]—*Ann. Soc. Hort. Fr.*, **6**, 21, pp. 3–7, 4 fig.; 8–11, 2 fig.; 12–18, 3 fig.; 19–23, 3 fig.; 24–27, 2 fig., 1960.

The 1st paper notes the general characters of plant viroses and their control. The principal virus diseases of market-garden crops are tabulated, with symptoms, name of virus, type (polyphagous or specialized), means of perennation, and method of spread.

The 2nd paper gives a general account of lettuce mosaic. The disease is endemic and in certain conditions becomes epidemic, when over 80% of a crop may be attacked. This rather commonly happens with winter lettuce in the E. Pyrenees, among other places. Even in summer losses may reach 20%. The symptoms are particularly distinct at the beginning of growth, when the 1st 2 or 3 leaves have formed, and also at flowering on the bracts. Plants infected from seed appear normal up to the cotyledon stage, the 1st symptoms appearing with the 1st true leaf (as in Reine de Juillet) or, more usually, much later (as in Blonde du Cazard). French vars. reacting by vein-clearing only are Gotte à graine jaune, Romaine blonde maraîchère, and Grosse blonde paresseuse; vars. with veinal mosaic are Bon Jardinier and Sucrine; those with serious necrosis are May Queen and Romaine Ballon; and with 'simple' necrosis Passion blonde and Trocadero. Slight anomalies in pigmentation occur in vars. rich in anthocyanin pigments. Among hypersensitive vars. Romaine Ballon, Passion blonde à graines noires, and May Queen for forcing develop a complete necrosis of the floral buds. Seed transmission is 12–30% in Blonde de Versailles and 10–15% in Trocadero and Blonde du Châtelet (= Attraction).

The 3rd paper reviews the literature on the symptoms, conservation, and transmission of the viruses of bean common mosaic [map 213], bean yellow mosaic [cf. **38**, 449, 640], pea streak [cf. **38**, 554, *et passim*], pea top yellows [pea leaf roll], and pea enation mosaic [cf. **38**, 469, *et passim*], some of which are likely to be present in France.

The 4th paper is a general account of cucumber mosaic virus [cf. **36**, 763; **38**, 646, *et passim*] on cucumber, gherkin, and other cucurbits (including melon) and its control. In France the disease is of less importance on vegetable marrow, pumpkin, and watermelon. The cultivated and wild hosts are listed.

The final paper deals with resistance to bean common mosaic virus in beans (*Phaseolus vulgaris* and *P.* spp.), hybridization and selection, and tests for vascular necrosis. The vars. and spp. with the mosaic and the necrotic type of resistance are tabulated. Among French vars. resistance of the mosaic type is found in Coco nain blanc précoce, Michelet à longue cosse, Meridional, and Cabanais, which react only slightly with necrosis. The 'Robust' vars. are not susceptible to vascular necrosis, but their morphological characters make them unsuitable for cultivation in France. Several vars. of dwarf bean in France are resistant to and a few are tolerant of the virus. The resistance of Canieu, Negus, Cabanais, Michelet à longue cosse, and Coco nain blanc précoce is due to a necrotic reaction governed by a single dominant factor. The French pole bean var. Phénomène is tolerant. The other spp. of *Phaseolus* (i.e. haricot d'Espagne, *P. lunatus*, *P. vulgaris* [vars.] *aborigineus* and *nanus viride* [*viridis*], *P. dumosus*, *P. retusis*, and *P. filiformis*) are completely resistant. The paper concludes with a short note on known information concerning bean yellow mosaic.

BORGES (MARIA DE L. V.). **O virus do mosaico amarelo do Nabo — características e dispersão no campo.** [Turnip yellow mosaic virus—characteristics and dispersal in the field.]—*Agricultura* (*Rev. Direc. Serv. agric.*), *Lisboa*, *1959*, 3, pp. 30–31, 3 fig., 1959.

A summary of essential information on the occurrence of the virosis on turnip and

Chinese cabbage in the vicinities of Lisbon, Sintra, and Coimbra and its insect transmission [**38**, 329].

Knösel (D.). **Ein außergewöhnlich starkes Auftreten der Adernschwärze am 'Filderkraut' im Jahre 1958.** [An extraordinarily severe occurrence of vein-blackening on Filder Cabbage in the year 1958.]—*Zbl. Bakt.*, Abt. 2, **113**, 6–10, pp. 212–214, 2 fig., 1960.

This outbreak of infection by *Xanthomonas campestris*, reported from the Institut für Pflanzenschutz der Landwirtschaftlichen Hochschule Stuttgart-Hohenheim, reduced the yield of white cabbage, grown commercially in the Filder plain near Stuttgart, from a normal av. of 6 dc./are to 3. Further heavy damage occurred through rapid decay in storage and during processing, while the increased moisture content of the heads was another source of depreciation. The severity of the epiphytotic was doubtless enhanced by the damp, warm weather prevailing in Sept., when rainfall was 146% of the normal and the mean air temp. of 16·1° C. exceeded the long-term av. by 1·5°. Part of the crop was totally destroyed. The typical symptoms of the disease were observed and the causal organism was demonstrated microscopically and culturally.

Noll (J.) & Gottschling (W.). **Bekämpfung der durch Molybdänmangel verursachten Herzlosigkeit an Blumenkohl.** [Control of whiptail in Cauliflower, caused by molybdenum deficiency.]—*Nachrbl. dtsch. PflSchDienst, Berl.*, N.F., **13**, 9, pp. 169–172, 1959. [Russ., Engl. summ.]

In areas of Germany with known Mo deficiency intensive cauliflower cultivation, combined with heavy sprinkling, leads to the development of whiptail and to economic loss [**35**, 410]. In pot experiments by the Biologische Zentralanstalt Berlin some improvement was obtained by addition of sodium molybdate or ruscalin sp. [**36**, 564]. Appropriate liming is recommended [cf. **37**, 456]. Of 20 cauliflower vars. examined in the field and in pot tests Lecerf and M 16/1 were particularly tolerant, Heerener Bester, Sechswochen, Riesenkönig, and Delfter Markt very susceptible.

Lüdecke (H.) & Winner (C.). **Farbtafelatlas der Krankheiten und Schädigungen der Zuckerrübe.** [Colour plate atlas of diseases and disorders of Sugar Beet.]—83 pp., 86 col. pl. (144 fig.), 16 fig., Germ., Engl., Fr., Latin index I–VIII, Frankfurt am Main, DLG-Verlag, 1959. DM. 28.

A short section of descriptions of the various types of damage (due to mineral deficiencies, viruses, fungi, bacteria, and insects), with notes on control and a key to the symptoms, is followed by a collection of excellent coloured plates with trilingual captions.

Šutić (D.), Jončić (M.), & Djordjević (R.). **Über den Einfluß des Gelbsuchtvirus auf den Samenertrag und die Samengüte der Beta-Rübe.** [On the influence of yellows virus on seed yield and seed quality of Beet.]—*Z. PflKrankh.*, **66**, 11–12, pp. 681–684, 1959. [Engl. summ.]

At the Station für Anbau und Selektion des Zuckerrübensamens, Aleksinac, Yugoslavia [cf. **36**, 228], sugar beet plants of the var. Aleksinac, grown for seed under conditions of natural infection, were observed throughout the growing season. At harvest on 20 July 1958 100 plants with typical yellows were compared with 100 which had escaped the disease. The former showed a 46·8% loss in seed yield and a reduction in the size of the glomerules, which were on av. 16·1% lighter than those from the latter; germination was reduced by 4·5%.

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